SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. L.—No. 21. [NEW SERIES.] NEW YORK, MAY 24, 1884. [$3.20 per Annum. [POSTAGE PREPAID.]

A NEW CABLE RAILWAY SYSTEM.

Of late years the rapid increase in size and population of many of our cities has brought into prominence the question of rapid communication between their distant parts, and the result has been that various systems of railroads have been put into operation to supplement those worked by horses.

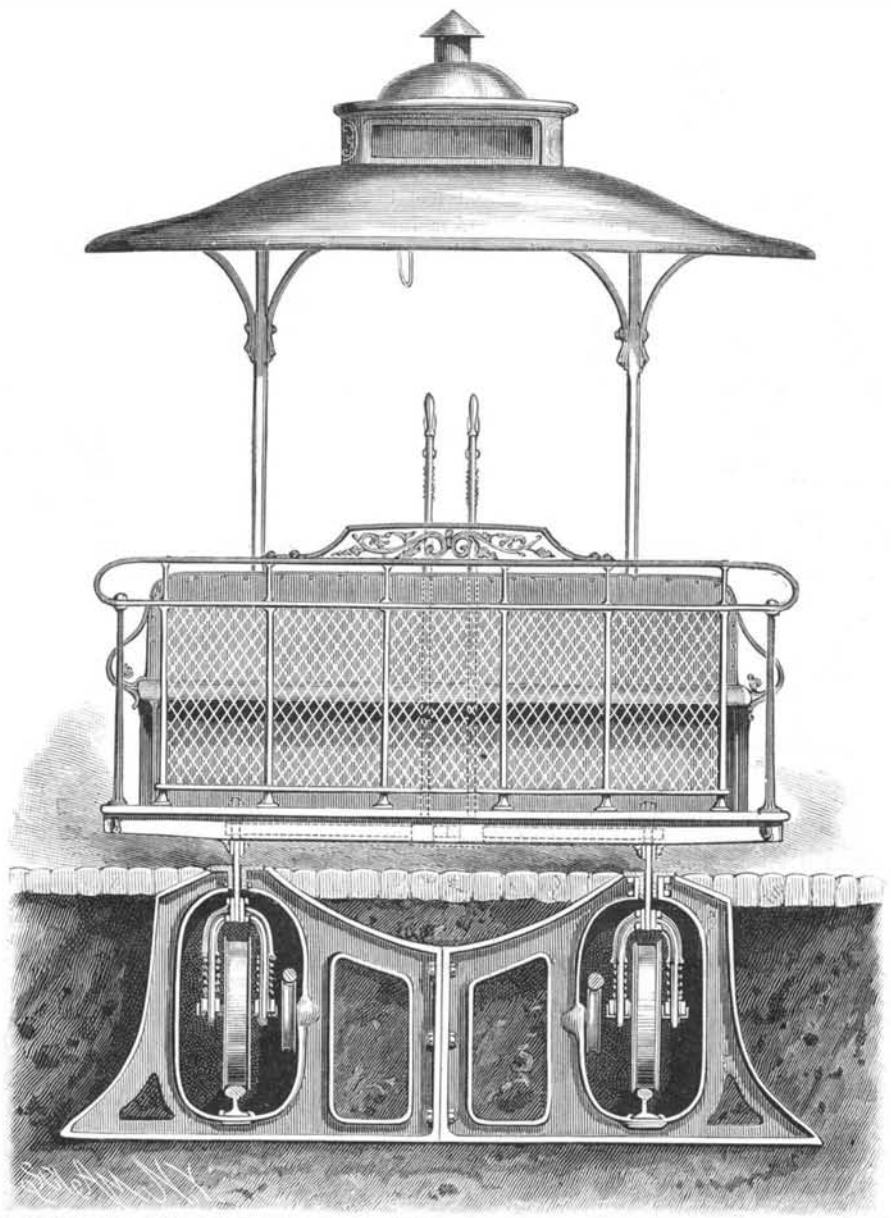
Among them we find, especially in New York city, the elevated roads, which, although they fulfill the object desired, are nevertheless attended by such grave and numerous inconveniences as to make their general adoption out of the question.

More recently cable railways have been put into operation in several cities, such as San Francisco and Chicago, and the results attained have been such that many now conceive this to be the best plan of car propulsion.

In these roads the cars run, as usual, upon tracks laid in the street, and running below the ground between the tracks is a trench or tunnel, through which a cable driven by a stationary engine travels. A slot permits of the passage of the bar to which the grip is attached, which when gripping the cable propels the car at the same rate as the cable travels. Although these roads are, in a measure, successful, they nevertheless present a number of disadvantages, and it is with a view to removing these that the system represented in our engravings was devised.

This system differs radically from all others in the fact that the wheels of the cars are placed underground in the same tunnel in which the cable travels.

The accompanying illustrations show a general and a cross sectional view of the new cable railway, that on page 326 being an isometrical view showing the grip arrangement. It will be seen that no tracks are laid in the streets, but in their stead



two slots appear which communicate with two tunnels, constructed in the following manner:

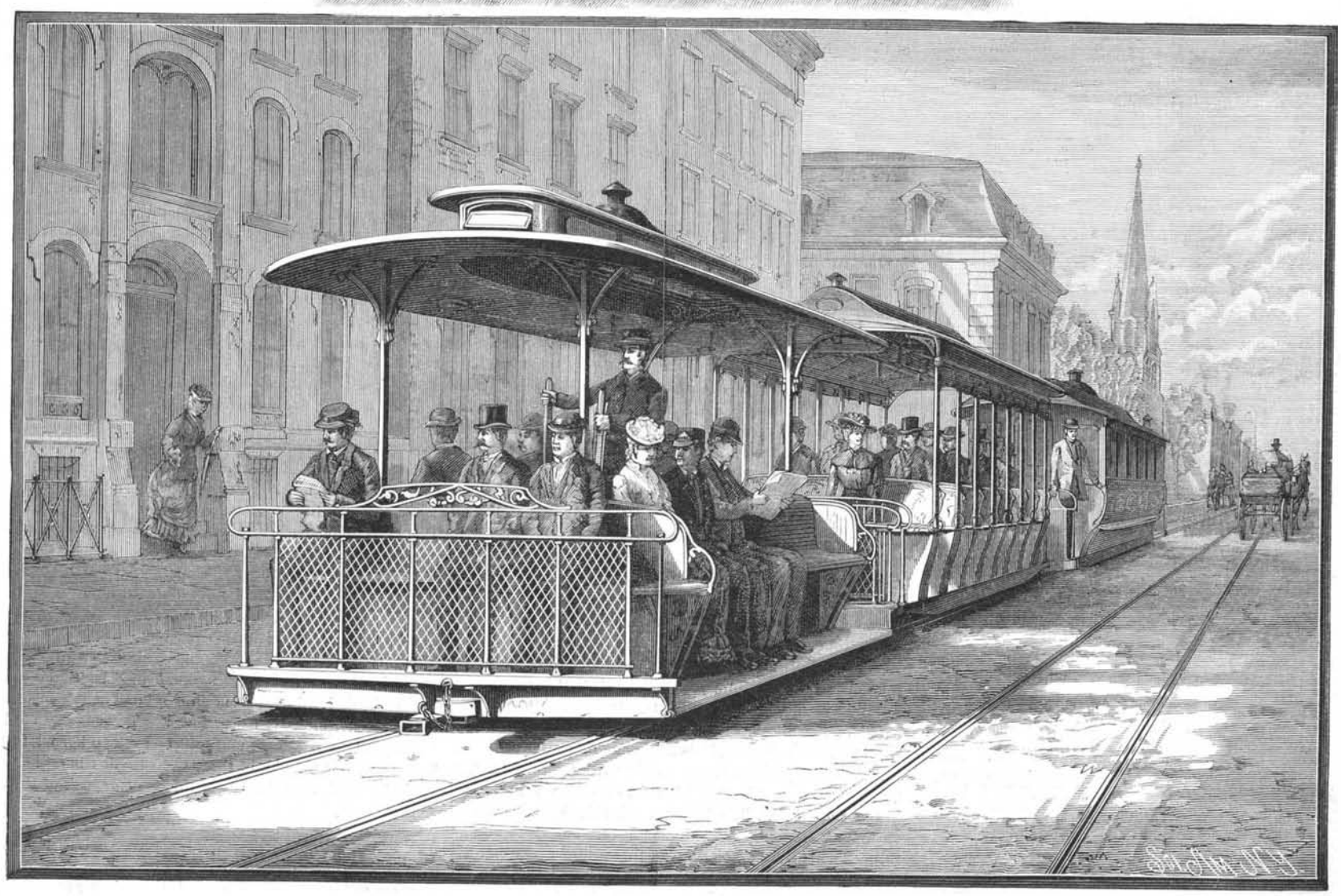
Upon a bed of concrete there are erected cast iron chairs, bolted together at their ends so as to form one piece. Each of these double chairs has two oval openings, and all openings on the same side are connected by sheet iron, thus forming two separate passages or tunnels. All the intervening space between these tunnels is filled up with concrete, and upon this solid bed the paving stones are laid, the distance from the bottoms of the chairs to the top of the pavement not exceeding four feet.

The rails are laid on the bottom of the tunnels, and at suitable intervals along the sides pulleys are provided upon which the cables travel. The car runs on four 24 inch double flanged wheels, and is supported by four steel standards half an inch in width, which pass through the slots and are attached to the fork-shaped journal bearings, which rest on springs.

The slots are formed by two angle irons placed half an inch apart, the tops being flush with the pavement. This does away entirely with troublesome tracks and leaves the street unbroken from side to side, besides providing an excellent track for vehicles to run on without fear of breaking axles or wheels when turning aside.

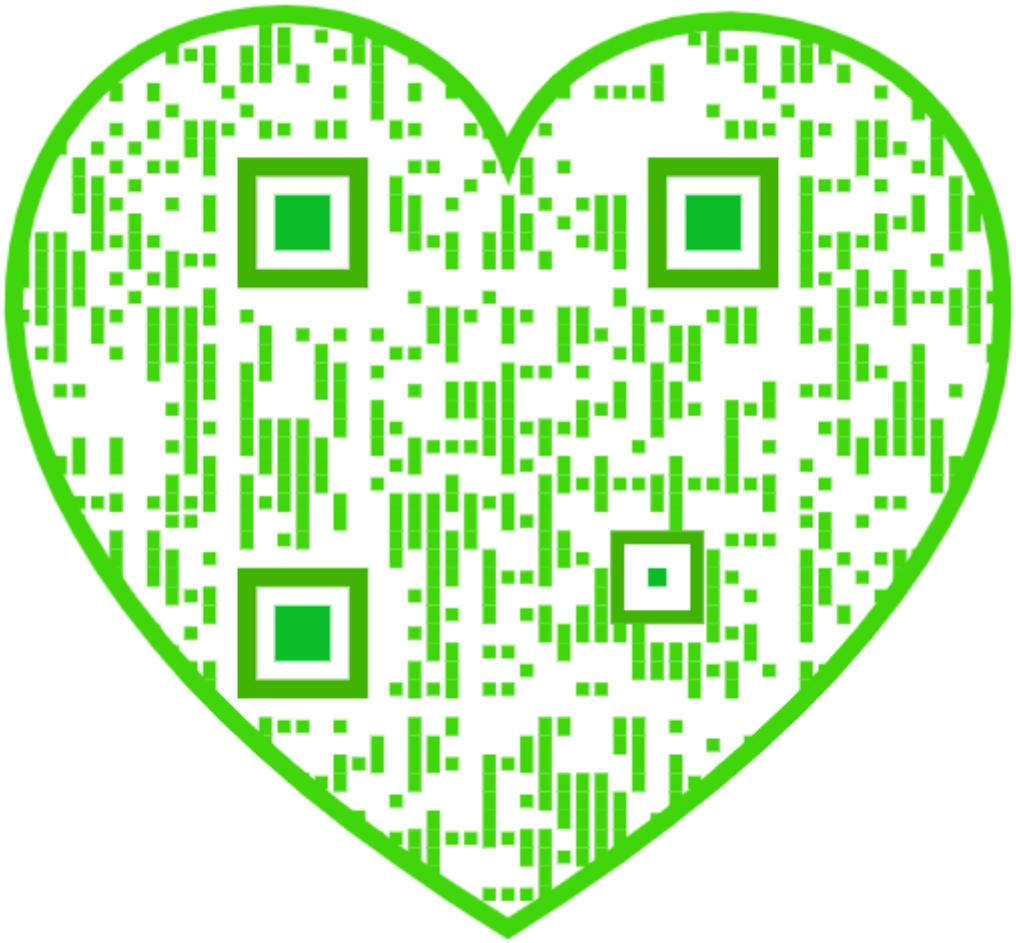
Another very important feature of this system is the means provided for establishing varying rates of speed, according to the amount of traffic in the street. This is effected by means of two cables, a slow speed and a high speed one in each tunnel, each of which has a constant speed of its own. Each grip car is provided with two levers, and by throwing out one or the other the corresponding grip is fastened either to the slow speed or the high speed cable. Thus the car can

(*Continued on page* 326.)



A NEW CABLE RAILWAY.—CROSS SECTION AND GENERAL VIEW.

© 1884 SCIENTIFIC AMERICAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 361 Broadway, corner of Franklin street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 361 Broadway, corner of Franklin street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin street, New York

NEW YORK, SATURDAY, MAY 24, 1884.

REMOVAL.

The SCIENTIFIC AMERICAN Office is now located at 361 Broadway, cor. Franklin St.

Contents.

(Illustrated articles are marked with an asterisk.)

Animals to converse, teaching... 325
Ants, red, to destroy..... 329
Battery, sodium, new..... 321
Bell, form of, improved*..... 328
Belts, leather, elasticity of..... 330
Bird, dancing, the..... 324
Bite, dog, not always fatal..... 325
Bleaching process, Thompson's*. 326
Boiler flue cleaner*..... 328
Boxes, driving, brass..... 328
Bridge building co., incorp. of a. 321
Bridge, Harlem River, plan for.. 322
Business and personal..... 330
Cable railway system, new*...319, 326
Canal, Corinth, the..... 328
Canned goods and adulterations. 328
Contemporaries' opinions..... 322
Copper, conductivity of..... 321
Discoveries, remarkable*..... 327
Diseases, infectious, prevent. for 325
Engine, fun of running..... 323
Engineers, Elec., Am. Insti. of.. 321
Ethylene..... 323
Evolution, doctrine of 325
Exchange, Produce, New York.. 321
Explorations in Yucatan*..... 327
Explosion, mysterious, a..... 325
Gravimotor, Hall's*..... 322
Hectographs, gelatine mass for. 329
Hot region, a..... 322
Hydrogen, liquefaction of..... 321
Inventions, agricultural..... 350
Inventions, engineering..... 330
Inventions, index of..... 331
Inventions, mechanical..... 330
Inventions, miscellaneous..... 330
Insects, maple tree..... 325
Ivory, artificial, making..... 323
Jack, lifting, improved*..... 322
Light, artificial, of the future.... 322
Maya civilization, the..... 325
McCormick, Cyrus, death of..... 321
Mosaic, Roman, antique..... 324
Motor, hydraulic, Zschiesche's*. 323
Nails 320
Notes and queries..... 330, 331
O'Conor, Charles, death of..... 321
Organ, parlor, design for*..... 323
Oxygen, inhalations of..... 329
Patent laws, menace to..... 324
Patents, decisions relating to.... 321
Petroleum as fuel for mills..... 321
Pisciculture, progress of..... 329
Pits, refuge, in wind storms..... 324
Plates, steel, producing..... 329
Saw, stone, new..... 321
Ship cleaner, new, Cooper's*..... 328
Shoe making by machinery..... 324
Staircase, folding, Chase's*..... 322
Statue of Liberty, Bartholdi's.... 323
Steam at 1,000 lb. pressure..... 320
Steamers, idle..... 326
Sunflowers, money in..... 320
Swamps, draining, experiment in 329
Thought, speed of..... 325
Wens, cure of by ether..... 325

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 488,

For the Week ending May 24, 1884.

Price 10 cents. For sale by all newsdealers.

PAGE

I. CHEMISTRY AND METALLURGY.—Nickel Plating on Zinc.—By Prof. H. MEIDINGER..... 6994
Oxidation of Sulphur Compounds.—By Dr. G. LUNGE..... 6995

II. ENGINEERING AND MECHANICS.—An American Coal Breaker.—With description of operations required for preparing anthracite coal for the market.—5 figures..... 6990
Improved Torpedo Launching Apparatus.—With several figures. 6991
Steel Beams and Struts..... 6991
Brandt Rock Drill at the Arlberg Tunnel.—With engraving..... 6992
The Riachuelo, Brazilian Armor-clad Turret Ship; its Construction and Performances.—By J. D'A. SAMUDA.—Paper read before the Institution of Naval Architects..... 6993
The Riachuelo.—Her guns, armor, engines, etc.—Comparison with the Chicago..... 6993

III. TECHNOLOGY.—Chemico-mechanical Printing Processes.—By HERMAN MEYER..... 6994
How to Work the New Copying Process.—With engraving..... 6994
Oleum Gaultheriæ.—Oil of wintergreen.—Methods of distilling same..... 6995
The Gases supplied to New York.—Their manufacture and composition..... 6995

IV. METEOROLOGY AND MAGNETISM.—Daily Variations of the Strength of the Wind on Land and Sea.—Researches of W. KOPPEN..... 6988
The Mechanical Theory of Magnetism..... 6998

V. GEOLOGY.—Notes upon Geological Explorations and Surveys in the Far West.—By L. P. GRATACAP.—Early explorers and their published accounts of their work..... 6988

VI. NATURAL HISTORY.—Lynx and Grouse.—With full page engraving..... 6983
The Asiatic Elephant in Freedom and Captivity.—By G. P. SANDERSON, supt. of government elephant catching operations in Bengal.—The elephant's intelligence and docility.—Usual height.—Uses and power of its trunk.—Age.—White elephants.—Modes of capturing and training elephants..... 6983
Microscopical Live Box for Fish.—2 figures..... 6986

VII. HORTICULTURE.—Show Beds of Hyacinths at Haarlem.—With engraving..... 6986
Improved Garden Frame.—With engraving..... 6987
Ages at which Trees transplant Best..... 6987
How to grow an Oak in a Glass of Water.—1 engraving..... 6987

VIII. MEDICINE.—Carbolic Acid.—How procured.—Nature of the acid.—As a therapeutic agent, an anæsthetic, a dentifrice.—Effect on animal organisms.—Vinegar its antidote..... 6997

IX. MISCELLANEOUS.—Ancient Copper Implements from Mexico.. 6987
Japanese Fireworks.—3 figures..... 6990
Poisonous Pigments and Wall Papers..... 6996

X. BIOGRAPHY.—Cetewayo.—With portrait and engraving showing him laid out in his hut after death..... 6996
Dr. Rianer Ritter von Schmerling.—With portrait..... 6996

STEAM AT A THOUSAND POUNDS PRESSURE.

Jacob Perkins, an American in England, who was the father of the high pressure system of heating by hot water in closed circuits, early gave his attention to the immense power of steam at high pressure for the projection of missiles of war, and so far perfected a steam gun as to exhibit it before the Duke of Wellington in 1824. It was very effective, but the "Iron Duke" considered that a steam boiler that threw away balls as fast as that did would be out of place in an army, and would waste ammunition. From this, steam as a high pressure power has slumbered, with occasional revivals, for more than a half century.

About 1840 a steam rifle made by Perkins was brought to the United States, and exhibited at the southwest corner of Broadway and Chambers Street, New York. It consisted of a steel barrel of medium rifle size, a lever valve, bullet magazine, with a revolving plug arranged for feeding single bullets or a volley. The whole swiveled upon a substantial frame.

The steam generator was of the vertical tubular type, consisting of a strong wrought iron pipe of three inches internal diameter and about eight feet high, with eight internal tubes, each about one-quarter inch in internal diameter. The chamber of the large tube was connected with the valve chamber of the gun by hydraulic pipe with metallic swivel attachment, while the internal tubes were connected with a coil of hydraulic pipe forming the walls of a portable furnace, so that steam used for operating the gun was derived from a secondary generator; the primary circulation being a closed hot water circuit with an air expansion chamber, both divisions having hydraulic or high pressure safety valves.

A small hydraulic pump worked by hand served to feed the generator with the water required for steam; the whole apparatus being very compact, occupying but a few square feet of floor.

A cast iron target a hundred feet away completed the plant.

The closed circulation of hot water from the coil in the furnace through the small tubes in the generator carried the pressure up to a thousand and more pounds to the square inch in a few minutes, and would set the safety valve singing in a tone unknown at ordinary pressures. Under this pressure no water issued from the tiny apertures of the gauge cocks; a blue vapor could be discerned, the tone giving the indication of steam or vater.

The safety valve upon the generating or circulating coil was set at three thousand pounds to the square inch, and would sometimes blow off when the gun was not in action, or the water low in the generator.

The heat of the water in the circulating coil was so great as to immediately blue the surface of the pipe when freshly scraped near its entrance to the generator, and would fire pieces of pine instantly.

The heat of the steam in the gun chamber frequently melted the bullets, and rendered volley firing very difficult; for on more than one occasion the whole volley was melted in the chamber by the sticking of the first bullet. The report from the discharge much resembled that of the ordinary rifle, with perhaps less sharpness.

The bullets fell from the iron target in dust, when thrown at the highest pressure; while from lower pressures they were battered into all shapes, from cones to flat, ragged disks.

A peculiar feature of that high pressure steam apparatus with the necessarily high temperature of its active element was the entire absence of any form of packing; every joint was a metallic contact, and the valves of hardened steel with seats of the hardest bronze.

ELASTICITY OF LEATHER BELTS.

One excellent, if not absolutely necessary, quality in a belt is elasticity. Under some circumstances a belt that is non-elastic and only pliable will act, but it is not so useful as a belt that combines elasticity and pliability. A gut string used as a round belt is not elastic—only pliable—and to do effective duty it must be kept very tight, making a strain on the bearings of the spindles it connects. But a belt that is greatly elastic will develop its full driving power, even though it may run quite slack. An amateur foot lathe of considerable capacity can be run by an India rubber thong with so slight a tension as to allow the finger to pass between it and the scored pulley without pain.

Much of the value of leather belts is due to their elasticity; this, as well as their substance, aiding in their adherent contact with the pulley face. By the term elasticity the quality of stretch—permanent stretch—is not intended. An ordinary bullock hide is usually permanently stretched five inches before being cut up, but the elasticity of the belts made from it is not impaired. New belts also have to be "taken up" usually after running a short time. But there is an elastic quality in a well fitted belt that is recuperative; it will return on itself when the temporary strain is removed. It follows, then, that the periodical release of belts from their working strain is a reasonable practice.

A recent experiment appears to prove this. As a test, a mechanic put new leather belts on two iron turning lathes at the same time. The lathes stood side by side, the work on them was similar, and the belts were cut from the same roll. The belt on one lathe was thrown off every night, and that on the other was never released. The latter was shortened four times during its life, while the other was taken up only once, and when the continually strained belt was so nearly worn out as to require repairs, the nightly released belt was in excellent condition.

This treatment of belts is not always possible; the prime movers and secondary belts can hardly be released every night, unless in such cases as where a long belt is run with an idler pulley or tightener; but the small ultimate belts that drive lathe cones, drills, milling machines, planers, and many other tools and machines could be so treated without trouble and with a resultant economy.

NAILS.

A large dealer in builders' hardware said recently that the demand for clinch or clout nails and for chisel pointed wire nails had largely increased within a year, as compared with that for the ordinary cut nails, and that flooring nails with the wedged-shaped heads were also used in place of the nails with the flat upset heads. His reasons were that better work resulted from the better nails, and there was far less waste. For the coarsest purposes the less first cost of the ordinary cut nails with the flat head induced builders to continue their use; but he believed the improved form and better material of the tough wire and clinch nails would, in time, drive out the inferior material and defective form. The principal advantage of the wedge shaped head, as in floor nails, is that the head never breaks off in driving, as it is only a gradual enlargement of the body of the nail, instead of an upset across the nail. But the chisel point of the wire nail is its especial merit, as it cuts a clean passage through the fibers of the wood for the following of the body of the nail, instead of "stunting" and mutilating the fibers, as the blunt pointed nails do.

The common cut nails will not usually clinch, even when the clinch is turned in the direction of the grain of the wood; but they may be considerably toughened by heating to a red, and gradual cooling. A hardware establishment was burned a few years ago, and among the stores were nearly a hundred kegs of cut nails of various sizes. The remains from the fire were sold to another dealer, and as soon as the value of the burned nails became known he could sell no others until they were gone.

Money in Sunflowers.

Much has been written during the past few years about the value of sunflower seed for feeding to fowls and sheep. The value of the leaves of the plant for feeding to horses has also been favorably noticed. A correspondent of the Toronto *Globe* calls attention to the value of the seed for making oil. In his communication he writes:

Care should be exercised in selecting sunflower seeds, as there is a very great difference in the number of flowers, and consequently in the number of seeds produced, at least so I have proved in my own garden, some varieties ranging from one to three flowers, while others will produce as many as fifty, sixty, and seventy flowers on one stalk. When the object is to provide feed for cattle and fowl, the last variety mentioned will doubtless be found the best paying; when the purpose is to secure oil, only the best oil seed variety should be selected; and, as I have not experimented in this line for oil, I am at a loss which variety to recommend. Experienced farmers and gardeners already know that the plant will readily grow in almost every soil, but prefers light, calcareous land, unshaded in every respect. The quantity of seed required for an acre is from four to six pounds. In some cases the seed is drilled into lines eighteen inches apart, and the plants are subsequently thinned out to thirty inches apart in rows, thus giving about eleven thousand plants to an acre, and each plant produces about one thousand seeds—the better sorts would probably produce many more. In England it is recommended that the sunflower be earthed up when about one foot high, but it will require no further attention. It is said the yield is much increased by the use of a fertilizer, and old mortar is regarded as one of the best. The sunflower has long been grown for its oil seeds in India and Russia, and more recently its cultivation has been taken up in Italy and Germany. In China and Tartary it is produced in immense quantities, and why not equal quantities, as cheap feed for cattle and in henneries, if for nothing else. In Russia, where the production of seed is very large, the oil is expressed on the spot, and is largely employed for adulterating oil, while the purified oil is considered equal to olive and almond oil for table use. In India one acre of land is stated to yield 11½ hundredweight of seed, which in the press gives out forty-five gallons of oil, and is there compared with ground nut and applied to the same uses. I think Canada, including the Northwest, can produce oil in this way quite as well as India or Russia. I also find that experimental culture in France gave 1,778 pounds of seed, yielding 15 per cent of oil (275 pounds) and 80 per cent of cake; but the product (according to the French report) varies considerably according to soil, climate, and cultivation, and that the average may be roundly stated at fifty bushels of seed from an acre, and one gallon of oil from one bushel of seed; also, that the percentage of oil to seed ranges from 16 to 28, and that of husk to kernel from 41 to 60; but this may be in some measure attributable to the varieties used, though none of the reports speak of the varieties grown.

ELECTRIC lights have been introduced into a gunpowder manufactory in England. The buildings are scattered over three miles of territory, and the wires are carried above ground from a dynamo near the center of the inclosure.

© 1884 SCIENTIFIC AMERICAN, INC

Death of Cyrus H. McCormick.

This well known inventor, whose name will always be associated with improved harvesting machinery, died in Chicago, May 13, 75 years of age. He was born in Virginia, his father being a farmer of mechanical bent, and the inventor of several machines, one of which was a reaper that was not found practicable. Young McCormick experimented on a farm given him by his father, and, after having invented a hand cradle and a hillside plow, experimented on the reaper, for which he obtained patents in 1834. It was first placed upon the market in 1840. In 1845 he moved to Cincinnati, and in the same year secured patents upon several important improvements in the machine. In 1847 he moved to Chicago, where he has since lived, and where he erected large works for the manufacture of his reapers. Up to 1848 he had not made the machines himself, but had had them manufactured by a firm at Brockport, N. Y. In 1848 he began building them himself, and made seven hundred the first year. For some years past now the annual sales of the machines have ranged between forty and fifty thousand. His famous invention brought great wealth to Mr. McCormick, and many honors as well. Gold medals and grand prizes were showered upon him at expositions, and Napoleon III. gave him the Grand Cross of the Legion of Honor. His wealth he used wisely and well. In 1859 he founded and liberally endowed the Theological Seminary of the Northwest, at Chicago. He also endowed a chair in Washington and Lee University, Virginia, and gave to the University of Virginia a fine 26 inch refracting telescope. He was a member of the Presbyterian Church.

Death of Charles O'Conor.

Charles O'Conor was born in this city in 1804, of Irish parents. He received only a common school education and lessons in French and Latin, his father being unable to give him the benefit of an extended course of instruction. He studied law, and was admitted to the bar in 1824. A wonderfully accurate memory, complete fearlessness, and indomitable perseverance enabled him to overcome all difficulties, and, his abilities being recognized, he rose rapidly in his profession, and for half a century ranked among the foremost lawyers at the American bar. He maintained this position because of his strict integrity and impartiality, his vast learning, his knowledge of the law, and his intimate acquaintance with all its intricacies. He was connected with many of the most celebrated cases that have been before the courts during the past fifty years. He was good authority on the interpretation of constitutional law.

Mr. O'Conor died at his home in Nantucket, Mass., on the 12th inst., at the age of 80 years.

The Conductivity of Copper.

The true nature of electrical resistance is by no means well known; and the only light which the induction balance of Professor Hughes has as yet shed upon it has not revealed its true nature. An interesting observation recently made by Mr. W. Groves, the well known practical electrician of Bolsover Street, W., deserves to be more widely known. Mr. Groves took thin disks of brass and coated them by electro deposition with a thick layer of pure crystalline copper. He then cut similar disks of copper from the deposit, and tested them in the induction balance. The scale gave 200 as their induction value. The same disks, after being melted in a founder's furnace, only gave 100 on the scale, and after a second melting their induction value had fallen to nearly that of ordinary sheet copper, namely, from 50° to 80°. If, as many believe, the induction value represents the conductivity of the copper, there is here a great falling off, and it might be valuable, not only in a theoretical but a practical sense, to find out the true cause. Dr. Mathiessen found that copper lost in conductivity by absorption of oxygen, and the pure copper being fused in an ordinary founder's furnace may have lost its electric conducting power by absorption of this impurity. Should that prove to be the case, there is much to be gained by fusing copper in presence of hydrogen, which uniting with the oxygen would form water, and leave the copper in its pure condition.

New Sodium Battery.

The *Bulletin* of the Societe Internationale des Telephones has recently announced the formation in Paris of a syndicate with a capital of 12,000*l.* for working the sodium battery lately invented by M. P. Jablochkoff. Whether such an organization has been, or is to be, established, says *Engineering*, we do not know, but space may well be devoted to a short notice of the battery referred to. In designing it M. Jablochkoff's object was to obtain an element having a much higher electromotive force than any other hitherto devised, and for this purpose he has made use of pure sodium. This metal is used in thin plates, and is coupled with compressed carbon, such as is employed in other batteries, or the plates may be placed in a metal capsule, in the midst of broken carbon. Under such conditions, and subjected only to the humidity of the air, the battery yields the relatively high electromotive force of four volts, which may be raised to six volts by impregnating the carbon with certain metalloid solutions.

This latter fact, however, has no practical value, because the price of such solutions, and the difficulty of using them, make the arrangement quite impracticable. With a couple of sodium and copper, the electromotive force falls to three volts. Such a battery, which may be of value in some cases, is made up of a thin plate of sodium, and a piece of red copper gauze. It will be seen that the force of this battery is considerably in excess of others now in use. So far as we know, there is not yet sufficient information as to the durability and the internal resistance of the sodium battery, to establish any useful comparisons with ordinary types. On account of the avidity with which sodium decomposes water, and absorbs oxygen, it is necessary to shield the battery from exposure when it is not in use, and for this reason it should be kept, except when active, in a bath of naphtha, or at all events in a hermetically sealed vessel. M. Jablochkoff asserts that the waste of the sodium, that is to say, its combustion, beyond what is converted into useful energy, is extremely small. One of the objections, which naturally present themselves to this battery, is the great precaution which must be taken in using it, on account of the explosions which occur when sodium is brought into contact with water. With proper precautions, however, such a danger is not great, although more than one serious accident has happened from this cause.

The Liquefaction of Hydrogen.

M. Olszewski recently stated, in the *Comptes Rendus*, that he has liquefied hydrogen by the aid of liquid nitrogen; his previous use of liquid oxygen being unsatisfactory. The nitrogen was compressed to 60 atmospheres, and cooled in a glass tube to —142° C., for a considerable time by the aid of ethylene evaporating in a vacuum; and in this way was liquefied. The pressure being diminished to 35 atmospheres, the nitrogen began to boil with such rapidity that it seemed white and opaque in the upper portions of the tube containing it. If the pressure was maintained at this point, the nitrogen ceased to boil; wholly clarified itself; and showed a very pronounced meniscus. The liquid nitrogen, amounting to from 3 to 4 cubic centimeters in volume, preserved this condition for a considerable time, slowly evaporating, and producing an increase of pressure in the apparatus. At length its meniscus became less and less distinct; and it finished by completely vanishing when the pressure gauge stood at 39·2 atmospheres; which is, therefore, the critical pressure of nitrogen. When the liquid nitrogen was reduced to the pressure of one atmosphere, it at first rapidly evaporated; but afterward, when scarcely half of it was left, the evaporation slackened, but the liquid itself remained completely transparent, without freezing. The nitrogen did not freeze, even when evaporated under a vacuum; but it was very different when hydrogen contained in a glass tube of about 4·5 millimeters internal diameter was plunged in the liquid. While the nitrogen evaporated in the vacuum, and the pressure of the hydrogen fell from 160 to 40 atmospheres, the hydrogen was observed to condense into a colorless transparent liquid, running down the sides of the tube. A moment later, the exterior surface of the tube was covered with an opaque white coating of the portion surrounded by the gaseous nitrogen, and with a semi-transparent ice on the portion dipping in the liquid nitrogen. This ice and the white coating were evidently due to the nitrogen, which thus solidified upon the sides of the tube, prodigiously cooled by the ebullition of the contained hydrogen. The insufficient quantity of liquid nitrogen has not hitherto permitted M. Olszewski to observe the meniscus and critical pressure of liquid hydrogen; but he is convinced that nitrogen, in considerable quantity, boiling in a vacuum, will furnish the only means of liquefying hydrogen to its static condition.

Petroleum as Fuel in Rolling Mills.

Among the many ways in which efforts are being made to economically employ petroleum as a fuel, one lately tried at the Union Rolling Mill at Cleveland, Ohio, is said to have been a pronounced success. The apparatus is described as quite simple, and easily attached to an ordinary puddling furnace. What may be styled shallow pans, or receivers, are set upon the floor of the furnace, and in these pans are heavy, closely fitting perforated cast iron plates, lying upon shelves but half an inch raised from the bottom; leading to the centers of these receivers, from beneath, are oil pipes connecting without with a tank or barrel sufficiently elevated to give the oil a good head; intercepting the oil pipes near the furnace is a small cylinder in which is an automatic valve, which can be set at any position to automatically regulate the flow of oil. Auxiliary, are pipes for carrying exhaust steam for blast, a bridge wall back of the receivers to detain the flame, and a water-lined arch to protect the burners.

In operation, the automatic valve being set, the oil is allowed to flow into the receivers; a handful of cotton waste, ignited, starts the fire; the plates become heated, and the oil, forcing its way up under the plates, is instantly atomized, and rushes up through all the perforations—gases, hydrocarbons, and all—into a brilliant flame, leaving no residuum whatever beneath. The first fire was lighted about 9:30 A.M., but the full heat was not let on until about 11. At 12:10 P.M. the furnace was charged, and at 1:22 P.M—exactly one hour and twelve minutes—the first heat was concluded. The pig iron melted rapidly, the balling was performed without difficulty, and the ball went through the squeezer in excellent shape. Necessarily there were some drawbacks. The steam used for blast was scarcely dry enough, the pressure being only 70 pounds at most; there was a slight escape of smoke from the rear of the furnace when the draught was open, and a high wind at the time did not conduce to the most favorable test; nevertheless the results made a favorable impression on practical men who witnessed this trial.

This mode of burning petroleum is the plan of a Cleveland lady, and seems not unlike, in principle, the proposed way of burning petroleum in locomotives contemplated under the Holland patents.

DECISIONS RELATING TO PATENTS.

United States Circuit Court.—Southern District of New York.

MUNDY *vs.* LIDGERWOOD MANUFACTURING COMPANY.

When an inventor merely brings an old element into his machine, he makes no invention; but where he does more—dispenses with certain parts, duplicates others, rearranges and simplifies the machine—he must be held to have made an invention.

When a patent is for a combination, one element of which is a gear wheel with a cone supported in a peculiar manner, and the defendant uses the gear wheel with the cone, but the latter is supported differently, though the elements employed by the defendant are the equivalents of those of the complainant in the patented combination, *Held* that the defendant takes the complainant's combination and infringes his patent.

The New York Produce Exchange.

The dimensions of this great building, which was illustrated in the SCIENTIFIC AMERICAN for May 10, are as follows: Length on Broadway and Whitehall Street, 307½ feet; on Beaver Street, 150 feet; and on Stone Street, 149 feet; the tower being 40 by 70 feet, and 200 feet high. The aggregate floor surface in the building is 7½ acres, and the Board Room proper is 220 by 140 feet, 60 feet high in the center, and lighted by 23 windows, each 31 feet high, and a skylight over the center. The cost of the site and the pile foundations was $1,000,000, and the total cost of building and site about $3,000,000.

In this great building, by the aid of the cable, the telegraph, and the telephone, the principal commercial emporiums of two continents are brought into instantaneous commercial intercourse. Substantially all the agricultural productions exported from New York are bought and sold on the floor of the Exchange, and how large this business is may be estimated from the fact that in 1880 there was received at New York 59,000,000 bushels of wheat, 61,000,000 bushels of corn, and 5,000,000 barrels of flour; and in addition to these articles the transactions in beef and pork and their related products are always on an immense scale.

New Stone Saw.

A new sort of saw for cutting stone is described in *La Semaine des Constructeurs*, which seems to have advantages over those now commonly in use, and is easily and cheaply made and operated. In place of the ordinary long steel blades, supplied with sand to enable them to grind their way into the stone, the new machine presents only a slender endless cord, composed of three steel wires twisted together, which is stretched over pulleys in such a way as to bring the lower portion horizontally over the stone to be cut. The frame carrying the pulleys is movable, so that the cord can be brought into contact with the stone, or lifted away from it, at pleasure, and the whole is kept in rapid motion, while water falling in drops from a reservoir above serves to moisten the stone. The three wires which form the saw differ from the ordinary kind in being square in section, and by twisting into a cord they are so turned as to present a succession of oblique cutting edges, which act, when set in motion, in nearly the same way as so many small chisels, while the rapidity with which the blows follow each other probably adds to the effect.

American Institute of Electrical Engineers.

At the call of a number of prominent electricians a meeting was held on the 13th of May, in the rooms of American Society of Civil Engineers, New York, and the organization of the above named society was effected.

The first of its kind in this country, it bids fair to have a prosperous career, and will undoubtedly tend to promote the interests of all those engaged in electrical pursuits. That the society is a representative one, will be seen by the list of officers elected which is as follows:

President: Dr. Norvin Green.

Vice-Presidents: A. Graham Bell, Charles T. Cross, Thomas A. Edison, George A. Hamilton, Charles H. Haskins, Frank L. Pope.

Managers: Charles F. Brush, William H. Eckert, Stephen D. Field, Elisha Gray, Edwin J. Houston, C. L. Hillings, Frank W. Jones, George B. Prescott, W. W. Smith, W. P. Trowbridge, Theodore N. Vail, Edward Weston.

Treasurer: Rowland R. Hazard; Secretary: Nathaniel S. Keith.

Incorporation of a Bridge Building Company.

The firm of Clarke, Reeves & Co., proprietors of the Phœnixville (Pa.) Bridge Works, has been merged in a corporation under the style of the Phœnixville Bridge Company. The works of the company have a capacity of thirty to thirty-five thousand tons a year, and among their productions have been the Kinzua Viaduct, numerous new bridges for the West Shore Railway, and the structures of the Second and Ninth Avenue elevated railways of New York city. Mr. David Reeves is president of the company, and Mr. Adolphus Bonzano is vice-president and chief engineer.

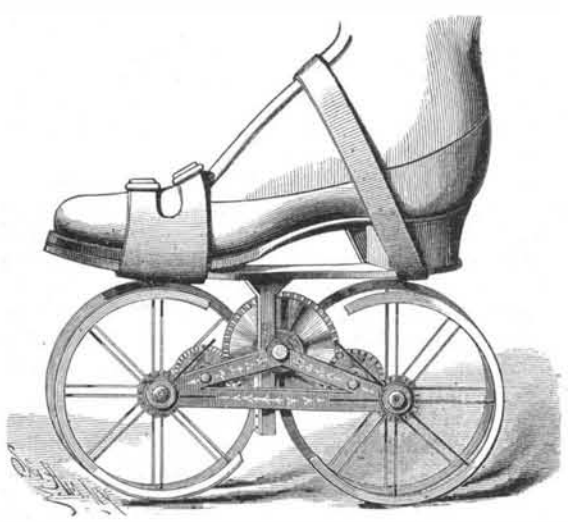
© 1884 SCIENTIFIC AMERICAN, INC

The Artificial Light of the Future.

In his "Science Notes," in the current number of the *Gentleman's Magazine*, Professor Mattieu Williams says: "My note on this subject last July* was preceded by one on the researches of Professor Radziszewski. I now learn that he has actually separated the luminous matter of the *Pelagia noctiluca*, one of the multitude of species of marine animals that appear like little lumps of jelly, and produce the phosphorescence of the sea. He evaporated to dryness 180 specimens; and from the residue he dissolved out (by means of ether) a peculiar kind of fat, which, mixed with potassa, gives out, when shaken, phosphorescent flashes. This is exactly what happens to the living animal. When quiescent it is not luminous; but if shaken or rubbed, it flashes. I have collected and examined a great variety of these animals at different times; the most remarkable occasion being one morning after a magnificent display of marine luminosity in the Mediterranean, a few miles off the shore of Algiers. The surface of the sea was incrusted, I might almost say, with countless millions of small jelly-like creatures, of spherical, ovoid, oblong, dumb-bell, and other shapes, varying in size from a mustard seed to a pea. A bucketful of water taken over the ship's side appeared like sago broth. They were all internally dotted with a multitude of what I suppose to be germs, that would be liberated on the death and decay of the parent. The practical importance which I attach to the study of the luminosity of these creatures is the fact that they supply light without heat. The costliness of all our present methods of artificial illumination is due to the fact that we waste a largely disproportionate amount of energy in producing heat as well as light. This wastefulness may be illustrated by supposing that we obtain a pound of the phosphorescent fat of the noctiluca, and divide it into two equal halves; making one-half into candles to burn in the ordinary manner, and using the other half to give out its light by cold phosphorescence. I am not able to give precise figures, but believe that I am well within the truth in estimating that the candle would dissipate 95 per cent of the potential energy of the fat in the form of heat; giving but 5 per cent of the amount of light that the other half pound would emit as cool phosphorescence. Let us, then, hope that Professor Radziszewski will continue his researches, and discover the whole secret of both the analysis and synthesis of this fat; and that of the glow-worms, the fire-flies, etc. Now that we can supply the confectioner with the flavors of almonds, raspberries, jargonelle pears, nectarines, etc., and imitate the perfumes and the richest colors of nature's sweetest and brightest flowers, all by the chemical manipulation of coal tar, we need not despair of solving the chemical problem of transforming mutton suet, or palm oil, or vaseline into glow-worm or noctiluca fat, to be used for illuminating purposes."
—*Journal of Gas Lighting.*

GRAVIMOTOR.

The engraving represents a small vehicle which is fastened to the foot, and is so constructed that when the weight is thrown upon the foot-rest the wheels are revolved, carrying the operator forward, and when the weight is removed the foot-rest is raised to its normal position by a spring. The rest is supported by a rod which has a strap attached to its lower end, the other end of the strap being secured to a wheel mounted on the same shaft with a cog wheel, from which motion is transmitted to the shafts of the driving wheels. Clutch disks engage when the rest is depressed, and the driving wheels are revolved. This brings a spring in tension, and when the weight is removed the rest is lifted. As a motor is fastened to each foot, it is only necessary to bring the weight of the body on each foot alternately. The



HALL'S GRAVIMOTOR.

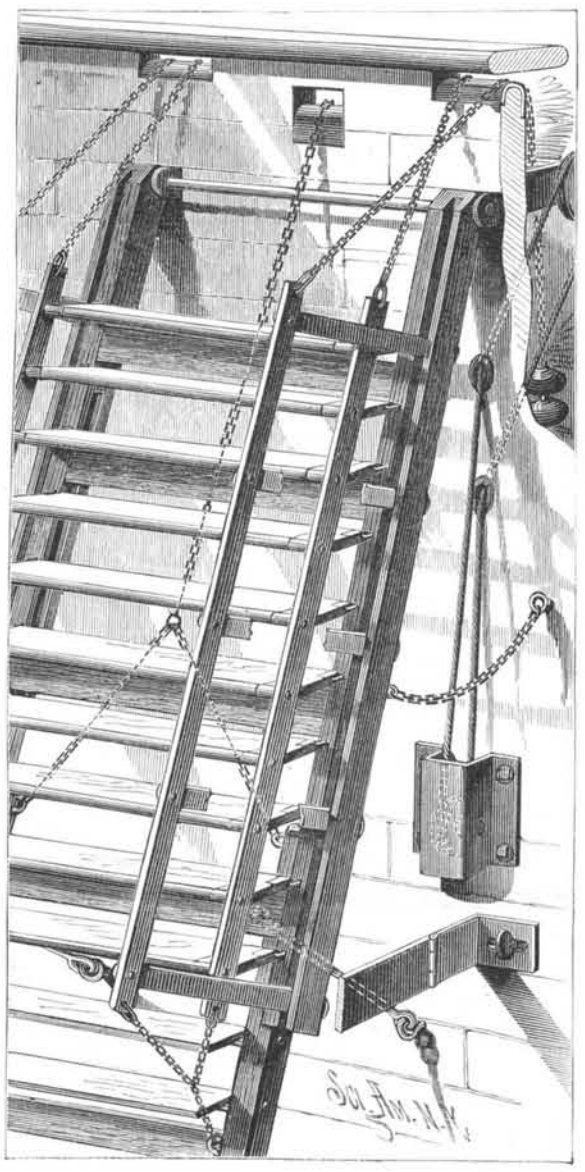
motor may be constructed with two driving wheels forward, with a single rear wheel journaled on a fork to a spring arm of the frame, above which a tongue projects to act as a brake. The foot rest is carried by a rack engaging with a cog wheel which is connected by suitable means with the shaft of the driving wheels.

This invention has been patented by Messrs. T. P. and J. B. Hall, and additional particulars can be obtained from the latter, whose address is School of Science, Toronto, Canada.

* See *Journal*, vol. xlii., p. 565.

FOLDING STAIRCASE.

An automatically folding staircase or ladder that can be used as a fire escape, for boarding vessels, etc., has recently been patented by Mr. Charles H. Chase, P. O. box 2,035, New Orleans, La. Our engraving shows the device attached to the side of a vessel. Two longitudinally grooved side bars, united by a series of transverse pieces, are hinged to the side of the vessel. Sliding in the grooves and united by cross pieces are two bars, to which is attached a chain, the upper end of which passes through an opening in the side of the ship, and is secured to a shaft placed directly before the opening. A brace rod connects the side bars with the



CHASE'S FOLDING STAIRCASE.

vessel. Pivoted to the upper edges of the side bars are steps whose upper edges are pivoted to rods having their lower ends connected by chains to the ends of the sliding bars. To the outer surfaces of the side bars are pivoted the lower ends of bars whose upper ends are pivoted to hand rails having their lower ends connected by chains to the lower ends of the sliding bars. Chains, which are fastened to the hand rails and to the rods to which the outer edges of the steps are pivoted, pass through holes in the ship's side and have weights on their inner ends. On one end of the shaft is rigidly mounted a grooved pulley, over which passes an endless chain that also passes over a pulley secured to the outer surface of the ship. A jointed locking plate is hinged to the outside, and is adapted to be swung over the lower part of the staircase.

When the staircase is to be swung outward for use, the shaft is so turned as to unwind the chain to allow the sliding bars to move downward. The weight of these bars carries downward and outward the outer end of the brace, thereby swinging the lower end of the staircase outward. At the same time the hand rails are raised and the steps swung into position. The shaft can be turned by means of a crank handle or by the endless rope from the outside. To fold the staircase the chain is wound upon the shaft, the sliding rods are drawn up, and the apparatus swung against the side of the vessel. The staircase can be made of any suitable length or width.

Plans for a New Harlem River Bridge.

Three plans for a new bridge over the Harlem River at One hundred and eighty-first Street, this city, have been laid before the Park Commissioners. The design of A. P. Boller, C.E., is for an iron cantilever bridge, 125 feet high, 100 feet wide, and having a central span 580 feet, to cost $1,500,000. The design of George McNulty, C.E., is for an arched iron bridge 132 feet high, 90 feet wide, and having a span of 543 feet; the approaches to be built of arched masonry; cost, $3,564,000. J. M. Wilson, C.E., presents plans for an iron cantilever bridge, 100 feet high, 80 feet wide, and having a span of 450 feet. There are two designs presented by Mr. Wilson, one contemplating stone piers and estimated to cost $1,193,347; the other with iron piers to cost $1,062,954.

A Couple of our Contemporaries' Opinions.

Referring to the removal of the SCIENTIFIC AMERICAN offices to 361 Broadway, the *American Garden* says, and we take pride in quoting their words, that as an "exponent of American progress the SCIENTIFIC AMERICAN stands unrivaled; and, combined with a high moral tone throughout, its educational value as a family paper cannot well be overestimated. We are glad," adds the editor, "to perceive the marked popularity and success which have compelled the publishers to remove to more spacious quarters. The new offices are beautifully lighted, airy apartments, more than fifty feet wide and one hundred and sixty feet long, and furnished with everything needful for the prompt and efficient execution of business.

"The SCIENTIFIC AMERICAN is not, as might be supposed from its name, devoted strictly to scientific matters only, but presents in a clear, practical manner the entire progress and development of our age: Science, art, literature, mechanics, industrial interests, inventions and discoveries of every kind, natural history, agriculture, horticulture, and many other topics of interest to every intelligent person."

The *Christian Intelligencer* has the following good word for us: "A great deal can be and ought to be said to commend the SCIENTIFIC AMERICAN to those who wish a popular scientific and mechanical journal of the highest character and greatest utility, edited with special ability disciplined by a long experience. It is possible that a few really valuable labor-saving inventions or important mechanical achievements in this country escape the vigilant editors of this weekly paper, but the number must be small. Besides being clearly described, many of such inventions and achievements are illustrated in pictures of unsurpassed excellence. Interesting and important scientific discoveries and facts are recorded by the hundred in the course of twelve months. At the beginning of the year we said that at least one copy should be in circulation in every school district in the United States. We still hold that opinion."

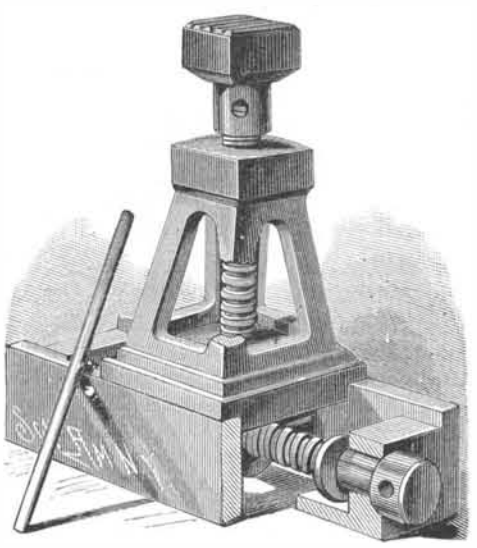
A Hot Region.

One of the hottest regions of the earth is along the Persian Gulf, where little or no rain falls. At Babrin the arid shore has no fresh water, yet a comparatively numerous population contrives to live there, thanks to the copious springs which burst forth from the bottom of the sea. The fresh water is got by diving. The diver, sitting in his boat, winds a great goatskin bag around his left arm, the hand grasping its mouth; then he takes in his hand a heavy stone, to which is attached a strong line, and, thus equipped, he plunges in and quickly reaches the bottom. Instantly opening the bag over the strong jet of fresh water, he springs up the ascending current, at the same time closing the bag, and is helped on board. The stone is then hauled up, and the diver, after taking breath, plunges in again. The source of these copious submarine springs is thought to be in the green hills of Osman, some 500 or 600 miles distant.

IMPROVED LIFTING JACK.

The screw jack herewith illustrated is arranged to shift the hoisting screw after the load is raised, to move the load while supported on the screw. The bed frame consists of two parallel side sills connected by cross pieces which are a little lower than the sides. The nut for the hoisting screw rests upon four legs, which, together with a broad base plate, are cast in one piece. The base plate rests upon the sides of the bed frame, upon which it can be shifted.

A strong screw nut is bolted to the bottom of the base plate. Fitted in bearings in the cross pieces and in the nut is a working screw, which is located directly under the



QVARNSTROM'S IMPROVED LIFTING JACK.

hoisting screw and the center of the base plate, so that with a plate of considerable length, to prevent turning so as to cramp between the sides, one screw is sufficient to shift the hoisting screw. By placing the cross pieces a little lower than the sides the base plate can be shifted along over them. The base plate is made with a hole under the hoisting screw in order that the screw may be made longer and have a greater range.

This invention has been patented by Mr. E. J. Qvarnstrom, and further information may be obtained from Mr. J. E. Hagey, of Vulcan, Mich.

© 1884 SCIENTIFIC AMERICAN, INC

Making Artificial Ivory.

The *Chronique Industrielle* gives the following description of a new process for making artificial ivory from the bones of sheep and goats and the waste of white skins, such as kid, deer, etc. The bones are macerated for ten or fifteen hours in a solution of chloride of lime, and afterward washed in clean water and allowed to dry. Then they are put with all the scraps of hide, etc., into a specially constructed boiler, dissolved by steam so as to form a fluid mass, to which is added 2½ per cent of alum.

The foam is skimmed off as it rises, until the mass is clear and transparent. Any convenient coloring material is then added, and while the mass is still warm it is strained through cloth of appropriate coarseness and received in a cooler, and allowed to cool until it has acquired a certain consistency, so that it can be spread out on the canvas without passing through it. It is dried on frames in the air, and forms sheets of convenient thickness. It is then necessary to harden it, which is accomplished by keeping it for eight or ten hours in an alum bath that has been used before.

The quantity of alum necessary for this operation amounts to 50 per cent by weight of the gelatine sheets. When they have acquired sufficient hardness, they are washed in cold water and let dry on frames, as at first.

This material works more easily and take as fine a polish as real ivory.

ZSCHIESCHE'S HYDRAULIC MOTOR.

The utilization of the motive power developed by water courses has given rise to a large number of apparatus, such as turbines, overshot and undershot wheels, etc., that have in recent times reached a high degree of perfection, and leave but little to be desired as regards performance, strength, and ease of keeping in repair.

These apparatus possess but one inconvenience, and that is that they require a fall of water that is not everywhere met with, thus subordinating the selection of the mill site to the configuration of the water course. Mr. Zschiesche's new hydraulic motor, represented in the accompanying cut, requires no fall for operating it, but may be set up at any point whatever along a river that has sufficient velocity. The apparatus undoubtedly offers the inconvenience of being quite cumbersome, and of requiring the use of a motive wheel so much the larger in proportion as the velocity of the current is less, but, as the figure shows, it is mounted very simply upon a float, and can be towed from one point to another of a water course. The system consists of a wooden framework that supports two iron wheels of different diameters. The larger of these wheels is the motive one.

Its axle, which rests in bearings, can be raised or lowered by means of a windlass, and the same is the case with the smaller wheel. It will be seen that it is thus very easy to cause the wheels to plunge sufficiently deep into the current to secure a proper working of the apparatus, whatever be the level of the water.

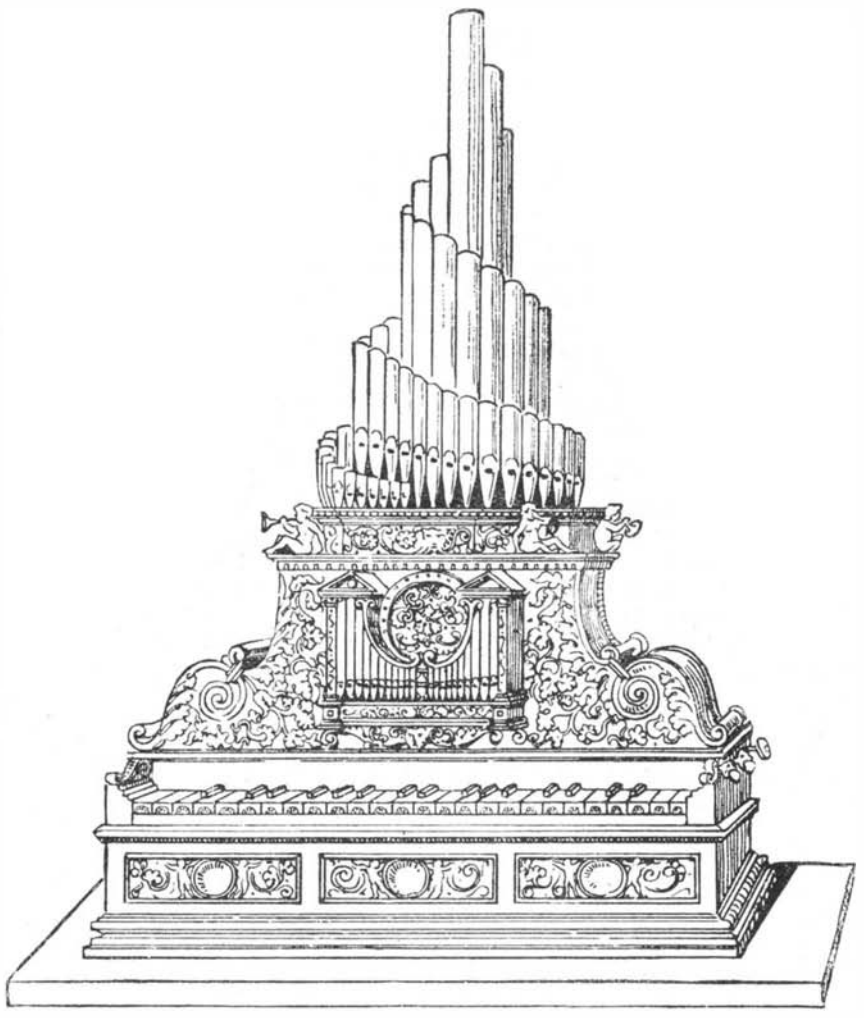
The spokes of the wheels terminate in hooks, which serve to carry the wheels along by means of two endless chains connected by paddles. The latter are each hinged upon an axis mounted upon the chains, and can be inclined at will in such a way that, whatever be the depth that the lower part of the motive wheel reaches, the paddles will always be perpendicular to the level of the water. The paddles are held in place by means of pins that may be transposed upon a quarter circle of iron.

The lower, movable part, which consists of two chains and paddles, dips entirely under water and is carried along by the current, the result being the revolution of the wheels that support the chains. The upper part is sustained by a roller.

The axle of the smaller of the two wheels is provided with a pulley that serves to communicate motion to the machines and apparatus of the building, partially shown in the foreground in our engraving. The problem in regard to the utilization of the motive power of water courses is greatly attracting the attention of engineers. Now especially, that dynamo electric machines have entered the domain of industrial practice, experiments of the kind that we have here noted are multiplying upon every side.—*La Nature.*

DESIGN FOR PARLOR ORGAN.

Our engraving shows a design of an organ made many years ago, in which all the pipes are said to have been made of silver We present it to our readers with the hope that it may serve as a suggestion leading to the production of something new and good in the form of musical keyed instruments. We are tired of the present stereotyped shapes of our pianos and organs. Will not somebody strike out in a new direction? A suitable design of so novel and popular a character that people must have it would be worth many thousands of dollars to the manufacturer who secured it.



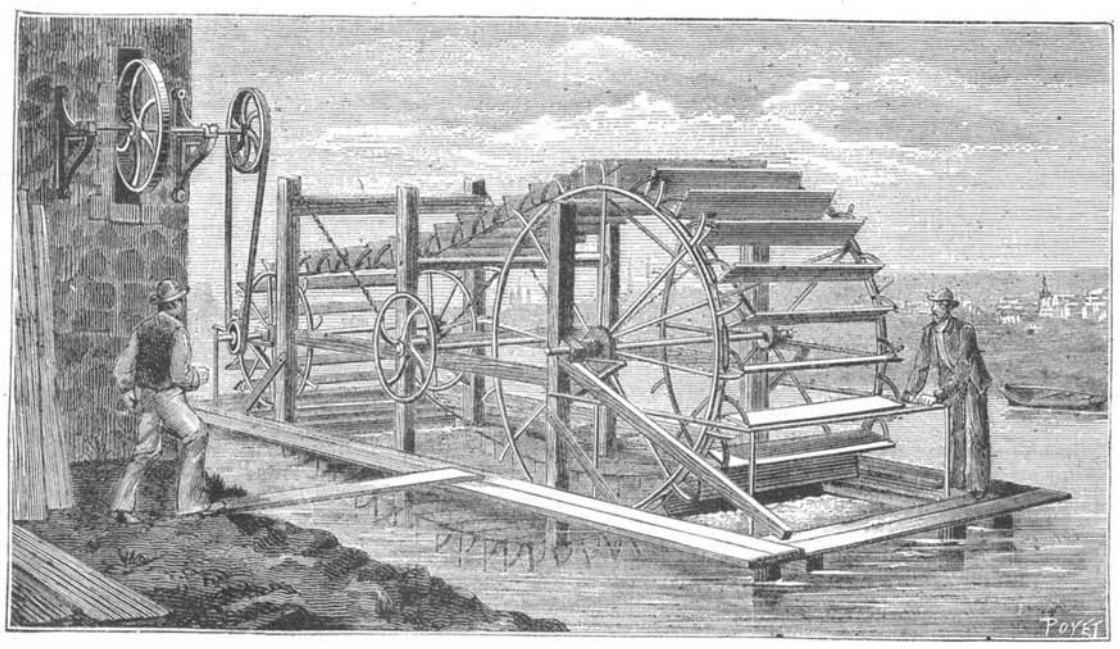
DESIGN FOR A PARLOR ORGAN.

The Fun of Running an Engine.

A reporter on the Chicago *Herald* had the following interview with a locomotive engineer:

"Lots of chaps think it would be fun to run an engine," said the driver, as he stuck his head, a flaming torch, and a long-necked oil can in under his machine, "but if the most of 'em would try it, they wouldn't like it quite so well. 'Tain't everybody can run a locomotive, either, though I s'pose it's like running a daily newspaper, which I've heard tell everybody can do. Now, a nervous man has no business in a cab; no more has a careless one, or a stupid cuss. To run an engine a man must feel his responsibility, and keep his head level. I don't believe half the people know what it is to run an engine. Now, there's the machine; that's the first thing, and it has to be in good order, and stay so. A locomotive has to stand wear and tear and weather that'd knock a stationary engine into smithereens. And no matter what emergency rises—freezing of pipes, or starting of flues, a loosening of packing, or heating of journals—we've got to know just what to do, and do it right quick, too; then when we're running there's the time cards and pretty often a new one; and the train orders—they are a life and death and reputation to us, and to read 'em correct and live up to 'em gives us no end of anxiety.

"Bet I've read a train order over a dozen times an hour—I am always so afraid of making a mistake or forgetting. You know the consequence of even a little mistake, sometimes. Then there's the signals to watch, the conductor's gong overhead, steam to keep up, time to make, whistle posts and crossings to look out for, bad spots in the road to be careful on, and along with all this there's the track ahead of ye which your eyes mustn't leave for more'n five seconds. There's the brakes, too—one is always worrying about them. I don't s'pose everybody knows, either, that we have to be mighty careful when we come to the top of a grade. You see in going up she labors hard, and as soon as she begins to descend she makes a rush, and there's the danger of breaking your train when the rear cars are still dragging on the up grade. This danger is especially great on freights, but no good engineer fails to shut off some of his steam when his engine reaches a summit. It isn't every fool can run a locomotive."



ZSCHIESCHE'S HYDRAULIC MOTOR.

Ethylene.

Before the Chemical Society on the 17th of April, Dr. P. F. Frankland read a paper on the influence of incombustible diluents on the illuminating power of ethylene. The present communication forms a sequel to a paper read by the author on the illuminating power of ethylene when burnt with combustible non-luminous diluents (Chem. Soc. Jour., Jan., 1884). In all cases the gases were consumed from a Referee's burner. Great care was taken to insure the purity of the ethylene and the diluents—carbonic anhydride, nitrogen, oxygen, and atmospheric air—employed. The author records his observations in a series of tables and curves. He sums up the principal results as follows: Mixtures of ethylene with the incombustible diluents carbonic anhydride, nitrogen, aqueous vapor, and atmospheric air, possess a lower illuminating power than pure ethylene. In all mixtures of ethylene with either carbonic anhydride, nitrogen, or aqueous vapor, the intrinsic luminosity of the ethylene is reduced. In mixtures of ethylene with atmospheric air, the intrinsic luminosity of ethylene remains unimpaired until the air forms about 50 per cent of the mixture.

Mixtures of ethylene with oxygen in insufficient quantity to form an explosive mixture possess a greater illuminating power than pure ethylene, the intrinsic luminosity of the ethylene being greatly increased. The disilluminating effects of carbonic anhydride, nitrogen, and water vapor are due partly to dilution and partly to refrigeration, *i. e.*, the cooling occasioned by the introduction of inert gas into the flame; this refrigeration is proportional to the specific heats of the gases, but in the case of the carbonic anhydride and aqueous vapor it is augmented by the absorption of heat which takes place in the dissociation of the aqueous vapor and in the reduction of the carbonic anhydride to carbonic oxide. Of the four diluents, carbonic anhydride, nitrogen, aqueous vapor, and atmospheric air, the first is the most and the last is the least prejudicial to the illuminating power; nitrogen and atmospheric air, however, become more equalized in their effects as the proportion in which they are present increases, complete disillumination of the ethylene being effected by the same proportion of each.

Bartholdi's Statue of Liberty.

A representation of this statue, as it will appear in place on its pedestal in New York harbor, has been published, as a large colored lithograph, by Messrs. Root & Tinker, of this city. The picture showing the proportion of the statue to the pedestal, with some view of the surroundings, gives a good idea of the whole as a work of art. The pedestal will be 177 feet 9 inches high, and the statue is 151 feet 2 inches, making the top of the torch 328 feet 11 inches above high water level.

THE latest novelty in advertising is a patent medicine manufacturer advertising for bald men who are willing to have advertisements painted on the tops of their heads, "for a high pecuniary recompense."

© 1884 SCIENTIFIC AMERICAN, INC

The Doctrine of Evolution.

The *Chemist and Druggist* (London) gives the annexed extracts from a paper read recently before the Oldham Chemists' Assistants' and Apprentices' Association by Mr. W. Buckley:

After defining the term evolution, the essayist remarked that it was generally confounded with the Darwinian theory, and gave an extract on the meaning of evolution from Dr. Hooker. He then proceeded to describe the various forms of animal life, beginning with the gregorina, and treating of the other forms to the vertebrata.

Gregorina is an animal found as a parasite of the cockroach, which takes in its food in any part of its surface. This is the lowest form of animal life.

Amœba was then described as seizing its food, which is forced through the mass of protoplasm and excreted anywhere.

Infusoria is a step higher, being distinguished by the possession of a definite mouth and œsophagus and egestive region.

Waterweed hydra, sea anemone, entozoa, earthworm, leech, insect, vertebrata, were described in order of superiority, the various changes in structure being pointed out until the highest point of animal life was reached in the case of the vertebrata.

The lecturer then explained the evolution of reproduction, describing the mode of reproduction, first, of the gregorina, by incystation—that is, the animal surrounds itself by a mass of gelatinous matter, and then splits up, each part becoming a fresh animal.

Infusoria are reproduced by splitting into two equal parts, and also by budding, a portion becoming attached to the animal, and after some time becoming free and having the powers of its predecessor.

In alluding to the descent of man, Mr. Buckley showed the similarity of the structure of the human being to that of some monkeys, especially the chimpanzee and gorilla, explained the arguments from the useless muscles of the human body, and indicated the reasons for regarding them as useless.

An Antique Roman Mosaic from Carthage.

BY G. H. HEAP, ESQ., CONSUL-GENERAL AT TUNIS.

Many who visited the Centennial Exhibition will remember seeing in the Tunisian section the large and beautifully executed mosaic representing a Numidian lion seizing an antelope. This admirable work, which probably dates from 100 to 50 years before the Christian era, is of Roman workmanship, and was discovered at Carthage in 1873. It formed a very small part of the vault floor of a temple dedicated to Astarte (Aphrodite), the tutelary deity of the Carthaginians. The Romans, who assimilated the gods of the people they conquered as easily as they absorbed their territories, erected a temple to the Goddess of Carthage, and adorned it with great splendor. It was situated on a commanding hill facing the sea, near the citadel and other public buildings.*

The Tunisian Government a short time since enacted a law prohibiting private search for antiquities, but granted this privilege to the son of the prime minister at that time in power. The finder of treasures or antique works of art was required, under severe penalties, to give immediate information to this official. The Arabs, however, in spite of imprisonment, bastinado, or fire, not unfrequently appropriated whatever fragments of sculpture, inscriptions, or mosaics, and especially funeral lamps and vases and coins, they might find, and sold them secretly to travelers and strangers.

Thus it came to pass, one day, that an old Arab sheik informed the British agent and consul-general, with a great show of secrecy and mystery, that he had discovered a wonderful mosaic floor, a portion of which he offered to take up and deliver for a consideration. He described the floor, which, even with due allowance for the imagination of the Bedouin, was evidently one of the most beautiful and complete works of the kind that had ever been discovered at Carthage. The sheik refused to tell where it was, but promised to bring the piece he had taken up to Sir Richard Wood's country seat, at Carthage, at night. He had recently "eaten stick," or received the bastinado, for having sold some antiquities to a tourist, and had reason to be cautious. A few nights later, however, he came with some eight or ten Arabs who bore the mosaic on their shoulders. A bargain was made, and the precious fragment was deposited in a magazine, where it remained until shipped to Philadelphia in 1875.

The floor of the temple from which it was taken has since been examined. It is of vast extent, and the designs were all life size. From the Arab's description it appears that the center figure represented a female, probably the goddess Astarte, driving a chariot drawn by stags, and around this central design were grouped animals of various kinds—lions, tigers, leopards, stags, antelopes, giraffes, boars, hares, even hippopotami, crocodiles, snakes, and fishes. The only part of the floor that the Arabs succeeded in removing besides the "mosaic lion" was the principal design, representing Astarte in the chariot. This was on its way to Sir Richard Wood's, when unfortunately one of the bearers slipped and fell, and the others fearing to be crushed under it—for it was even larger and more ponderous than the lion—allowed it to fall to the ground, where it was broken into fragments. The only portion, therefore, of this magnificent pavement that now exists is that in the National Museum; the rest was broken in the hasty and clumsy efforts of the Arabs to detach it in sections from its bed.

The "mosaic lion," as it came to be named at the Philadelphia Exhibition, is the largest and most perfect ancient mosaic in America, and it is quite unlikely that anything equal to it will ever find its way to the United States hereafter.

When the Vandals invaded Africa they destroyed all works of art, and to them are due the many headless, armless, and noseless statues found in Barbary. In destroying the temple of Astarte their iconoclastic frenzy was probably more immediately directed against the statuary and other sculptures and in overthrowing them, together with the walls of the edifice. The floor was covered with debris, upon which, in the course of centuries, a deep layer of dust was deposited, which protected the mosaic from the corroding effects of wind and rain, and to this we may attribute its perfect state of preservation.—*Proceedings Nat. Museum.*

* The remains of some of these edifices are still visible, although now the most conspicuous object is the chapel, erected in 1835 by Louis Philippe, King of the French, and dedicated to the memory of his ancestor, Louis IX., surnamed "the Saint," on the spot where tradition says he died of the plague in 1270 while besieging Tunis.

The Menace to the Patent Laws.

The British Government lately recognized the fact that its patent laws were not sufficiently liberal in their treatment of inventors, and accordingly it has subjected them to thorough revision, upon the very just theory that encouragement and protection of the inventive talent of a country is of direct advantage to the whole body of the people. Just as England has completed this reform, certain members of the American Congress have organized an assault upon our patent system, with an intent to make our patent laws far more unjust and far more discouraging to inventors than the British laws have ever been in modern times.

More than twenty bills, authorizing changes in the patent laws, have been introduced to Congress during the present session, and while nearly all of them inflict injustice upon inventors, some of them are positively iniquitous. We cannot summarize all of them, but some of the propositions contained in them are as follows: That any man may use any patent without regard to the owner's wishes or prices, by summoning a jury to fix a license fee; that no patent shall be granted for a longer period than five years; that a man who uses an infringement upon a patent can escape all penalties simply by pleading ignorance, the easiest plea that can be made; that the owner of a patent shall pay all costs of suing an infringer, even the fees of the infringer's attorneys, though the plaintiff may win his suit; that the owner of a patent in such a suit shall give bonds for the payment of costs, no matter how often the courts may have declared his claim valid.

These are but a few samples of the kind of legislation which is now threatened by the men who have been selected to make laws for this country. Respecting the whole mass of bills, we may say this: They represent simply a scheme to legalize the robbery of a class of men who have probably done more for this American nation than any other single class among our population. It was because the inventive genius of our people has had strong stimulation from the best set of patent laws now in existence, that we have been able to compensate for the scarcity and high price of labor in many portions of our country by the use of ingenious mechanical contrivances.

The man who will try to imagine what American farming, for example, would have been had not the farmer had at his command cheap labor-saving appliances, invented by Americans, may possibly form some kind of a dim idea of what this country has gained from its inventors and from the wisely ordered patent system which has inspired them to labor in all directions. The so-called patent reformers not only refuse to recognize that great obligation, but they propose to destroy the system which has achieved so much, and to violate the standing contracts made by the Government with the inventors, and for which the inventors have paid their money.

We do not hesitate to say that no Congress that ever sat in Washington ever offered a greater menace to the general public interest; and we may assert, further, that if this Congress supplements its ruinous agitation of the tariff question with these outrageous patent laws, it will be remembered with execration as a public enemy.

The plea made in behalf of the new bills is that innocent purchasers of patented contrivances have suffered under the present laws. No doubt there have been many instances of hardship of this kind, but the cases are comparatively few in number, and it is monstrous to replace a good law, which works occasional harm to the few, with a bad law which will work continual harm to the many. Innocent men have been put in prison, but that is not an argument for the abolishment of prisons. The right thing to do, if anything must be done, is to make more severe the penalties against the man who infringes a patent and sells it, and to give the innocent victim swift justice upon the man who has swindled him. But the truth, we suspect, is that the demand for a change does not come from unsophisticated countrymen who have been deluded by sellers of sewing machines and hay rakes. More probably it comes from rich corporations, who want to steal and use for nothing inventions upon which they are now compelled to pay royalties. The indications are strongly in this direction, and it will be well worth while for leading inventors to combine money and labor in an effort to get down to the bottom facts while the bills are pending.

The few disinterested persons who give their assent to these proposed changes probably persuade themselves that a new mechanical idea really is not "property" in the right sense of the word. They understand how a man can own a horse and sell it, but they do not comprehend how a man can own and sell an idea. This is just the kind of obtuseness that we expect to find in a savage, who has no conception of intellectual things; but it is amazing to find it among civilized and intelligent men. The truth, of course, is, that ideas, expressed in mechanical forms, have exerted such power as to transform the methods of civilized society. Every convenience in modern dwellings, every railroad, every steam engine, every labor-saving machine of every kind, is simply the embodiment of men's ideas; and the mental stimulus which was necessary to give such ideas expression and force was obtained, in nearly all cases, from the promise of money reward. A man who has got a good mechanical idea in his head, has something that is worth far more than any single piece of real estate; for it is something which may serve millions of people at one and the same time; while the real estate can serve only a single owner. The idea is *property;* and the government which forbids it to have any value when it is once made public, simply gives its sanction to a very bad form of robbery.—*The Textile Record.*

The Dancing Bird.

A recent issue of the *Proceedings* of the U. S. National Museum contains an account, edited by Mr. E. Ridgeway, of the collection of birds from Nicaragua, made last year for the Smithsonian Institution by Chas. C. Nutting. The dancer bird is thus described:

"Fam. Pipridæ. *Chiroxiphia linearis* Bp.

"Abundant. Spanish name 'Toledo' (pronounced 'Tolay'do') on account of a fancied likeness to their whistling note. The natives also call this bird 'Bailador' or 'Dancer.' It was not until I had been in the region for some time that I understood why it was given this name. One day, while hunting through the dense forest, the profound silence was suddenly broken by the regularly repeated note of 'El Bailador,' and softly making my way toward the spot whence the sound proceeded, I witnessed one of the most remarkable performances it has ever been my lot to see.

"Upon a bare twig which overhung the trail at a distance of about four feet from the ground, two male 'Bailadors' were engaged in a 'song and dance' act that simply astounded me. The two birds were about a foot and a half apart, and were alternately jumping about two feet into the air and alighting exactly upon the spot whence they jumped. The time was as regular as clockwork, one bird jumping up the instant the other alighted, each bird accompanying himself to the tune of '*to-le-do—to-le-do—to-le-do,*" sounding the syllable '*to*' as he crouched to spring, '*le*' while in the air, and '*do*' as he alighted.

"This performance was kept up without intermission for more than a minute, when the birds suddenly discovered that they had an audience, and made off.

"With a little practice one can learn to call the birds very readily. I could have secured a very large number in this manner, had I been so disposed. Twelve specimens."

Shoe Making by Machinery.

The *Shoe and Leather Reporter* justly remarks that the introduction of labor-saving machinery has been the most potent cause of the changes that have been wrought in the shoe manufacture within a decade. The genius of inventors has devised implements for doing pretty much all the work that is required from the cutting to the finishing of a shoe, and doing it so neatly that the inexperienced cannot distinguish hand work from machine work, and the experienced know perfectly well that the latter is for all practical purposes as good as the former. The instruments first contrived for sewing leather were crude and imperfect; there were so many little defects about them that they were not regarded with favor, and did not do satisfactory service. But by degrees the faults have been so completely remedied that they do their work admirably, until now three-quarters of the handsomest shoes sold in the country are put together by machinery. In the factories the hands are distributed into "teams," each team constructing a particular part of a shoe, many men contributing in their several ways to its configuration. Of course the closest attention has to be given to all the details; it is essential that the materials should be selected with discriminating judgment; that the cutting should be so skillfully done that there may be no waste of stock on the one hand, and no inferior material used on the other.

Refuge Pits in Wind Storms.

A Georgia correspondent writes us that storm pits are made in his section about 8 x 10 feet and 6 feet deep, with roof on a level with or just above the surface of the ground, being usually ventilated by means of pieces of stove pipe inserted in the roof. Our correspondent says it has been suggested that, there being sometimes ten or twelve persons in these pits, the moist, warm air rising through the pipes makes a good conductor of electricity, and so would render such locations dangerous during an electrical storm, although his own inference is that they cannot certainly be more dangerous than crowded churches or railway cars, which are seldom struck by lightning.

© 1884 SCIENTIFIC AMERICAN, INC

Correspondence.

Maple Tree Insects.

To the Editor of the Scientific American:

My attention was called to the number of insects on our village maples, which indicated that they were dying. I at once cut a stick and inclose it to you, to ask, if it be worthy your notice, to give it a description in your paper, and what, if anything known, is a remedy for the pest, for pest it most assuredly is.

Some of the maples are covered with them just as is the small piece of twig I send, and some of the trees are dying. Can we get rid of the pest? I remain, respectfully,

P. H. CUTLER.

Louisa Court House, Va., May, 1884.

[The twig accompanying the above letter was covered with the males of the common cottony bark louse of the maple (*Pulvinaria innumerabilis* Rathvon). This species is common all over the country on maple, sycamore, and osage orange. A closely allied species is found on the grape, which may possibly be identical with this. A very complete paper on this species was written by the late J. Duncan Putnam, and published in the first volume of the Proceedings of the Davenport Academy of Sciences. A short account with figgures will be found in the Annual Report of the Department of Agriculture for 1880. As to remedies, nothing better can be recommended than the kerosene emulsion, the formula for which has already been given in the columns of the SCIENTIFIC AMERICAN. It should be well diluted and thrown over the tree in as fine a spray as possible.—C. V. RILEY.]

A Mysterious Explosion.

To the Editor of the Scientific American:

As an old subscriber I would like to inquire of you whether I have discovered something new, or what I did make. While experimenting to make a poisonless silver wash, I mixed the following articles: One part chloride of silver, twelve parts of lye of potash (which was the result of common, only dissolved by air), and the same amount (by measure) of aqua ammonia. I left that mixture stand for eight days, and then, by stirring the mixture, an awful explosion took place, and where the matter spread about, after becoming dry, and some time after, through brushing or rubbing of the spots it produced a noise like an electric spark.

J. E. F.

Washington, D. C., May 5, 1884.

[J. E. F. has rediscovered Berthollet's fulminate of silver, which has been described in the larger treatises on chemistry for about a century. It is one of the most violent and intractable of explosives; when dry, the gentlest friction of a feather may set it off. No practical use has been found for it, and many distressing accidents have resulted from handling it. It is produced by digesting precipitated oxide of silver with ammonia. In J. E. F.'s case the oxide of silver was a product of the action of the lye on the chloride of silver.—ED. S. A.]

Cure of Wens by Ether.

M. Vidal cures wens by injecting them with ether. Used for this purpose, ether acts as a caustic—but much more mildly than is generally the case—by setting up inflammation of the cystic contents, and finally inducing suppuration of the cyst itself. This it effects without producing any of the painful sensations or constitutional symptoms which are caused by throwing it into the circulation as a stimulant of the system at large. Its action is entirely confined to the structure operated upon, in which it gives rise to nothing more than a feeling of tension, if the injection be made too forcily.

The ether employed should be as pure as possible; that at sixty-five degrees, such as is usually sold in the drug stores, answers very well. It is injected with an ordinary subcutaneous syringe, without the necessity of those precautions which have to be observed in the application of caustic solutions—since it does not corrode the metallic fittings of the instrument, or cause the formation of any deposit which can clog its piston.

As to the number of injections required and the quantity of ether to be introduced at each of them, M. Vidal has found that, for wens of the face or forehead, which are not larger than a hazelnut, no more than five or six drops need be injected at a time. Larger tumors on the scalp may require ten drops, part of which, owing to want of elasticity in the cyst walls, is liable to escape on the withdrawal of the syringe. As a rule, the injections should be suspended so soon as the cyst begins to suppurate.

The number of injections is of greater importance than the quantity introduced. Speaking generally, a wen the size of a hazelnut will require two or three injections of five drops; if as large as a walnut, ten drops must be injected four or five times. The mode of treatment in every other respect will depend entirely upon circumstances as they arise. The little operation is performed as follows: The tumor is grasped by the left hand, so as to put its integument on the stretch, thereby bringing plainly into view the glandular orifices it contains; into the most dilated of these, which is often distinguishable by a fatty scab, the needle of the syringe is inserted perpendicularly. It is then, before making the injection, moved about within the cyst cavity, so as to break up its sebaceous contents, and prepare them for the complete reception of the ether; at the same time, the walls of the cyst are scraped and here and there lacerated with the needle point, with the object of promoting their final elimination. The succeeding injections are made in the same way and at the same opening. They are stopped as soon as the wen begins to enlarge, becomes reddened and softer, and is the seat of a slightly painful sensation of throbbing or heaviness, which, however, never amounts to a headache. The tumor is now punctured at its base, from which issues a jet of purulent fluid; next, the contents of the cyst are discharged in the form of a whitish mass, resembling vermicelli, and mingled with the shreddy detritus of its walls. When the wen is of average size, this part of the process will be completed in six or eight days. During the ensuing days the integument of the cyst proceeds to suppuration, and is discharged through the same puncture, together with remnants of the internal membrane. As the tumor dwindles, the skin surrounding it gradually contracts, and soon it is represented by a mere core of conjunctival infiltration, which, when the last drop of pus and the last fragment of cyst wall have made their exit, shrinks into a small indurated lump covered with healthy skin, and without any sign of the orifice by which the former mass has been evacuated. This consummation is generally reached between the fifteenth and twentieth days.

The efficacy of M. Vidal's procedure was strikingly exhibited in the case of a man of intemperate habits and debilitated constitution who came under his care in the Hospital St. Louis for an eruptive disease, and who had also been troubled, for five years, with an enormous wen which prevented him from wearing a hat or cap, and from lying on his back or on his left side at night. The incumbrance was completely removed by ten injections of ether. During the treatment the patient suffered no pain; he took no care of himself, often exposing his tumor to the cold, without protective dressing, and in the ward which he occupied there were four erysipelatous patients. Yet nothing untoward occurred; the region operated on is now perfectly smooth and level with the rest of the scalp, and not the slightest trace of a cicatrix is left to mark the site of the excrescence. —*Lermoyez, Bull. Gen. de Therapeutique.*

Teaching Animals to Converse.

Sir John Lubbock in a note to *Nature* says: I take the opportunity of stating the progress which my dog "Van" has made, although, owing greatly no doubt to my frequent absences from home, and the little time I can devote to him, this has not been so rapid as I doubt not would otherwise have been the case. Perhaps I may just repeat that the essence of my idea was to have various words, such as "food," "bone," "water," "out," etc., printed on pieces of cardboard, and after some preliminary training, to give the dog anything for which he asked by bringing a card.

I use pieces of cardboard about ten inches long and three inches high, placing a number of them on the floor side by side, so that the dog has several cards to select from, each bearing a different word.

One correspondent has suggested that it would be better to use variously colored cards. This might no doubt render the first steps rather more easy, but, on the other hand, any temporary advantage gained would be at the expense of subsequent difficulty, since the pupil would very likely begin by associating the object with the color rather than with the letters; he would, therefore, as is too often the case with our own children, have the unnecessary labor of unlearning some of his first lessons. At the same time the experiment would have an interest as a test of the condition of the color sense in dogs. Another suggestion has been that, instead of words, pictorial representations should be placed on the cards. This, however, could only be done with material objects, such as "food," "bone," "water," etc., and would not be applicable to such words as "out," "pet me," etc.; nor even as regards the former class do I see that it would present any substantial advantage.

Again, it has been suggested that "Van" is led by scent rather than by sight. He has no doubt an excellent nose, but in this case he is certainly guided by the eye. The cards are all handled by us, and must emit very nearly the same odor. I do not, however, rely on this, but have in use a number of cards bearing the same word. When, for instance, he has brought a card with "food" on it, we do not put down the same identical card, but another with the same word; when he has brought that, a third is put down, and so on. For a single meal, therefore, eight or ten cards will have been used, and it seems clear, therefore, that in selecting them "Van" must be guided by the letters.

When I last wrote I had satisfied myself that he had learnt to regard the bringing of a card as a request, and that he could distinguish a card with the word "food" on it from a plain one, while I believed that he could distinguish between a card with "food" on it and one with "out" on it. I have no doubt that he can distinguish between different words. For instance, when he is hungry he will bring a "food" card time after time until he has had enough, and then he lies down quietly for a nap. Again, when I am going for a walk and invite him to come, he gladly responds by picking up the "out" card and running triumphantly with it before me to the front door. In the same way he knows the "bone" card quite well. As regards water (which I spell phonetically so as not to confuse him unnecessarily) I keep a card always on the floor in my dressing room, and whenever he is thirsty he goes off there, without any suggestion from me, and brings the card with perfect gravity. At the same time he is fond of a game, and if he is playful or excited will occasionally run about with any card. If through inadvertence he brings a card for something he does not want, when the corresponding object is shown him he seizes the card, takes it back again, and fetches the right one.

No one who has seen him look along a row of cards and select the right one can, I think, doubt that in bringing a card he feels that he is making a request, and that he can not only perfectly distinguish between one word and another, but also associate the word and the object.

I do not for a moment say that "Van" thus shows more intelligence than has been recorded in the case of other dogs, that is not my point; but it does seem to me that this method of instruction opens out a means by which dogs and other animals may be enabled to communicate with us more satisfactorily than hitherto.

I am still continuing my observations, and am now considering the best mode of testing him in very simple arithmetic, but I wish I could induce others to co-operate, for I feel satisfied that the system would well repay more time and attention than I am myself able to give.

Speed of Thought.

Many people have noticed the remarkable quickness of thought in dreaming, how a long story, with many details and extending over a great period of time, will flash through the mind in a few minutes, but they seldom have any means of even approximately measuring the quickness with which they sometimes dream. There is now going the rounds of the press a story purporting to tell the dream of a railway engineer, which, if true, affords a means of measurement, and the story itself has every appearance of being a genuine relation of experience. The engineer had been without sleep and on duty for many hours, and at last fell asleep on his post. Then he dreamed quite an elaborate story of an accident resulting from a confusion of train orders; how he studied over the words of the dispatch, trying to make out their meaning, and then how, his train coming into collision with another, he was thrown into the air and dropped back into his seat in the cab with his hand on the throttle. At that instant consciousness returned, and he found that it was all a dream, and that although his train was traveling at the rate of 45 miles an hour, it had gone only 250 feet while the dream was passing through his mind, this distance being fixed by the position of the train with respect to signal lights on the line. This is the interesting part of the story, for if these measurements are approximately correct, the dream occupied less than four seconds of time.—*Ledger.*

The Bite of a Mad Dog not always Fatal.

The bite of a mad dog, it would appear, is not so fatal as is generally supposed. A report upon the subject for the Department of the Seine, issued by the Paris Prefecture of Police for the past three years, shows that of one hundred and fifty-six persons bitten by rabid dogs in 1881 eighty died; in 1882, nine out of sixty-seven bitten died; and in 1883, five only out of forty-five. With regard to the treatment of the bite of a rabid animal, the experience of the French doctors shows that the only remedy which can be depended upon to destroy the virus is the prompt application to the wound of cautery by red hot iron. Twenty persons died of hydrophobia in the Department of the Seine in 1881, nine in 1882, and four in 1883, as far as the official returns show. The decreasing number of deaths from this cause is attributed to the stricter measures adopted with regard to ownerless dogs. During the three years mentioned 11,564 stray dogs were captured in Paris and the department, and destroyed.—*St. James Gazette.*

Turpentine as a Preventive in Infectious Diseases.

The *Medical Record* tells us that H. Vilandt writes in the *Ugeskriftfur Laeger*, vol. viii., No. 8, 1883, concerning the value of the oil of turpentine in the treatment and prophylaxis of diphtheria and the exanthematous diseases. He states that he has never seen any of these diseases spread from a sick child to other members of the family when this remedy was employed. In many of his cases no isolation could be attempted, as the mother was the only female in the family, and was obliged to take care of both the sick and the well, continually passing back and forth from one to the other. His method was to pour from twenty to forty drops of a mixture of equal parts of turpentine and carbolic acid into a kettle of water, which was kept simmering over a slow fire, so that the air of the sick room was kept constantly impregnated with the odor of these two substances. He claims also that by this means a favorable influence is exerted upon the exudation in diphtheria, although it is by no means curative of the disease, and should never be relied upon to the exclusion of other remedies.

The Maya Civilization.

With this issue we conclude the series of illustrations and information thereon concerning the ancient Maya civilization of Yucatan, furnished us by Dr. Le Plongeon from his recent explorations in that region. These interesting pictures, showing something of the life of a people living in Central America many centuries ago, and of whose very existence even the world was so long ignorant, have attracted wide attention, and will no doubt contribute materially to stimulating that spirit of investigation which is so prominent a characteristic of the age. Our representations are faithful copies of photographs taken on the spot.

© 1884 SCIENTIFIC AMERICAN, INC

A NEW CABLE RAILWAY SYSTEM.

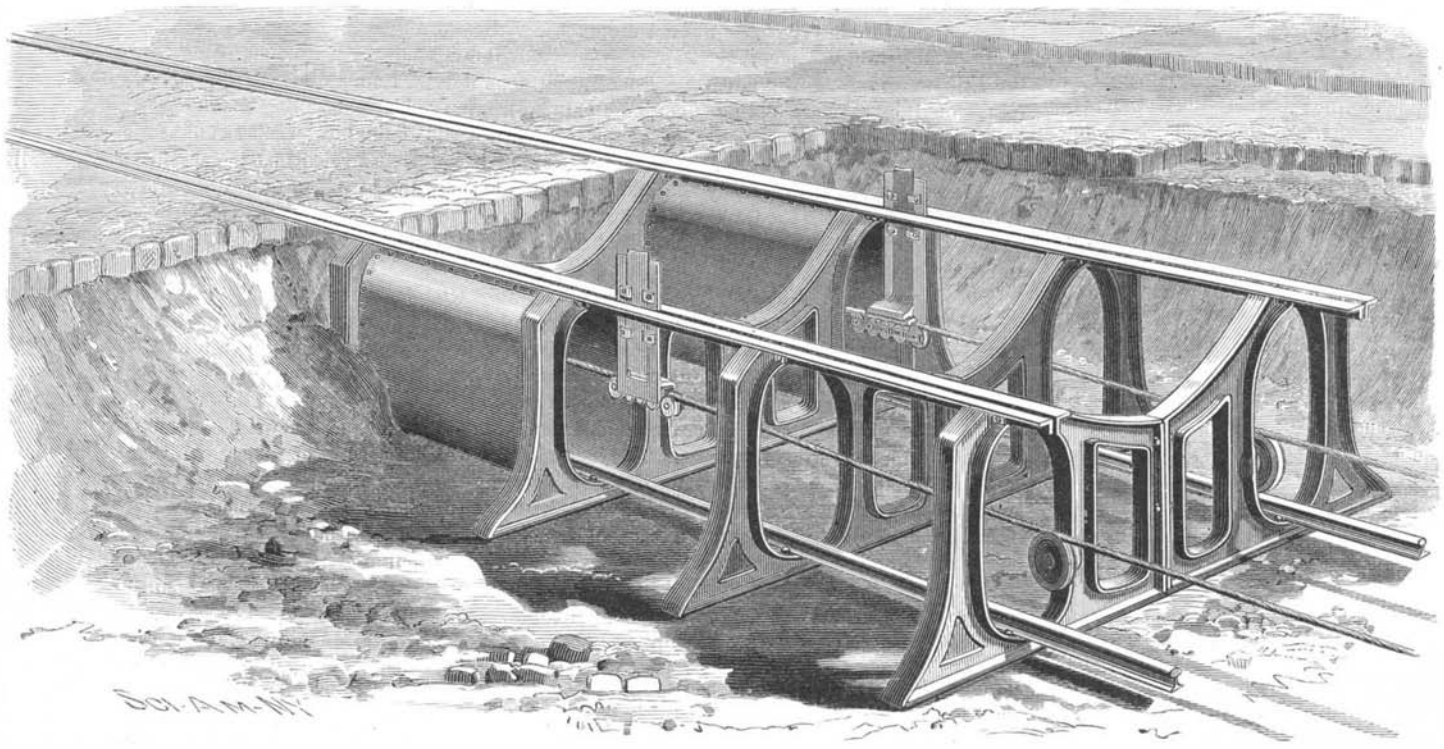
(*Continued from first page.*)

be propelled at a rate of 4 miles or 8 miles an hour at the will of the grip attendant. This feature is especially valuable for roads which run into the suburbs, where a high rate of speed is not objectionable, and it also affords a means of "making up lost time," when the road is accidentally blocked.

The cleaning of streets through which these roads run is greatly facilitated by attaching sweepers to the cables, and in winter the snow could be cleared for traffic as fast as it falls. From the nature of the system it will be seen that a snow blockade is impossible, since, the wheels being below ground, the one-half inch standards would pass through the snow with very little resistance. The floor and platforms of the cars, as the engraving shows, are close to the surface of the street, the platform requiring no steps—a great convenience for all, especially ladies and children.

This proposed system contemplates the building of a large main tunnel in the center of the street and two smaller ones directly under the chairs. The former will be of ample size to take in all necessary pipes and electric light wires, while the latter may be used exclusively for telegraph and telephone purposes. All the tunnels will be constructed of concrete, so that when once built they will last indefinitely. The increasing number of overhead wires and subterranean conduits makes it highly important that some system be adopted which will do away with both evils at the same time, and this proposed railway system, devised by Messrs. Orel D. Orvis and Nelson B. Adams, has this end in view.

The Orvis and Adams system, which presents many novel and interesting features, is controlled by the United States Cable Road and Subway Company, of No. 261 Broadway, New York, and those interested in city passenger traffic, as well as all city authorities and electric companies, are asked to examine into its merits.



A NEW CABLE RAILWAY.—ISOMETRICAL VIEW, SHOWING MANNER OF CONSTRUCTION

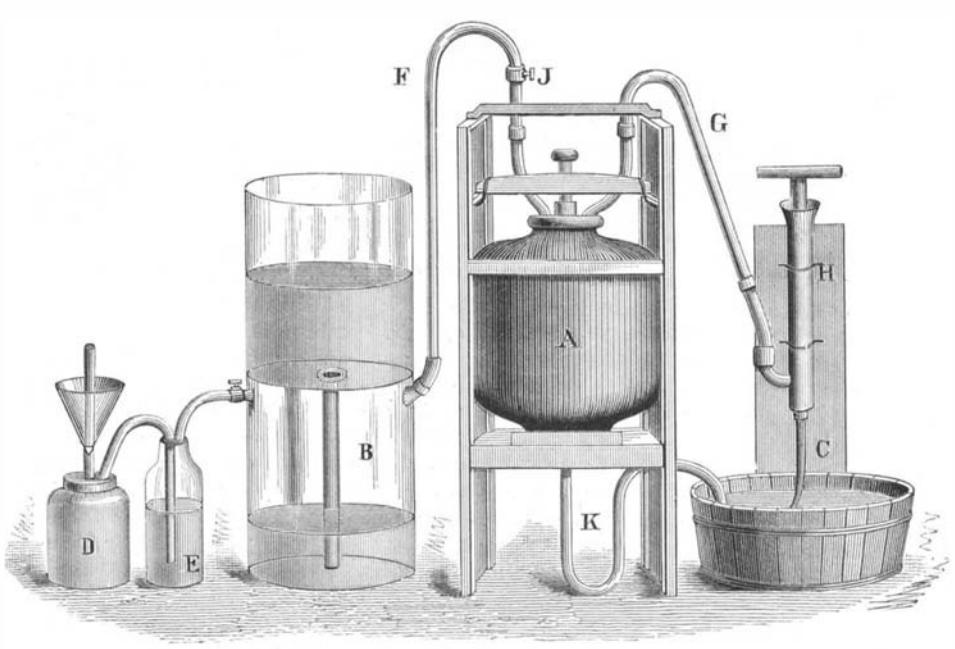
Idle Steamers.

Already about one-fifth of the total number of merchant steamers registered at northeastern ports has been laid up by the owners in consequence of their inability to obtain remunerative freights. The shipping trade is actually becoming worse instead of better, and the question of a remedy is beginning to strongly exercise the minds of the underwriters. Notices convening special meetings of the Mutual Insurance clubs in the Hartlepools, clubs which have an aggregate capital of over four millions sterling, have been issued, and it is the intention of the clubs to consider the advisability of increasing the return premiums for steamers detained in port by 50 per cent during the period from April to September. This is done with the intention of offering a premium to owners to lay up their ships, so as to produce a strengthening effect upon the freight market. The remedy seems a curious one, though at the same time it is no more out of place than the resolution of ironmasters to subsidize those who agree to put their furnaces out of blast in order to increase pig iron prices.—*The Engineer.*

A LINE of railway cars, to be drawn by camels, will shortly constitute one of the peculiar features of travel and transportation in Central Asia.

THOMPSON'S BLEACHING PROCESS.

When any marked advance is made either in applied science or the industrial arts, it is by no means wholly unprofitable or devoid of interest to take a retrospective glance at the history of the matter at issue. On the contrary, it may prove very profitable, as showing the various landmarks in progress which have been reached and passed, and highly interesting as indicating the degree of proximity in which present development stands in relation to ultimate perfection. It is in this connection that we here revert to the early days of bleaching, in order to bring out to the full the important advances recently made in that useful art by Mr. Jacob Baynes Thompson, the practical working of whose invention we have recently had the satisfaction of witnessing. The early days of bleaching stand a long way off from the present time, but we need go no further back than the second quarter of the last century to find the Scotch sending all their brown linen to Holland in the month of March to be bleached, and receiving it back in the following October. Then it used to be crofted, or spread out on the bleaching grounds for months, and sprinkled with water several times a day. Some advance was, however, made in 1749, when bleach works were established in the north of Scotland with tolerable success. The course of procedure consisted in first bucking the cloth or steeping it in alkaline lyes for some days, and then washing it and crofting it for several weeks. After bucking and crofting the goods some half dozen times, they were steeped in sour milk for some days and then washed and crofted, these processes being repeated until the bleaching was complete. The process was an expensive one, not only from the time occupied in effecting it, but from the large area of grass land necessary to carry it out.



THOMPSON'S BLEACHING PROCESS.

In course of time an improvement upon this method of bleaching, which was known as the Dutch method, was effected by substituting dilute sulphuric acid for sour milk in the souring process. This was a grand step in advance, for it reduced the time required for bleaching from eight months to four. But the year 1785 saw a marked improvement introduced by Berthollet, who suggested the application of chlorine to bleaching. Watt took up the question in the following year, and in course of time the chlorine process was adopted in bleach works, and chlorine forms the basis of the process as now carried out.

It would fulfill no useful purpose were we here to follow the various improvements which contributed to reduce the period required for bleaching from months to weeks and from weeks to days. We, therefore, pass on to describe briefly the process as we find it carried out in ordinary at the present time. Although great advances have been made, bleaching is still a comparatively slow process, and any recent attempts to hasten it have been carried out at the expense of damage to the fabric. In the ordinary process the goods to be bleached are first boiled with lime in a large circular boiler, or "keir," as it is termed. The boiling is continued for about seven hours, after which the goods are washed in clear water, and are then submitted to the souring process. This consists in steeping the goods for four or five hours in water made sour by means of hydrochloric acid. The goods are then washed again, boiled for nine hours in a soda lye, washed again, and then submitted to the "chemicking" process. This consists in steeping the material in a dilute solution of chloride of lime for about four hours. These processes, with the exception of the lime boiling, are repeated over and over again until the bleaching has been effected.

There are in all some sixteen distinct operations for ordinary cotton goods, the time occupied usually being from five to eight days. This condition of matters would now appear to be greatly changed by Mr. Thompson's ingenious process, which has now further reduced the time required for bleaching from days to hours. The main feature in this process consists in the peculiar and original methods of chemicking and souring, these two operations being performed at one and the same time. The bleaching liquid used is a very dilute solution of chloride of lime, of about specific gravity 1·0006, or less than a degree Twaddell. The decomposing or souring agent is carbonic anhydride, commonly known as carbonic acid gas.

There is another original feature in this process, viz., the use of a solution of triethylrosaniline and oxalic acid, through which the fabric is passed, the object being to remove the faint, natural yellow tinge of the cotton.

In carrying out the Thompson process, says *Iron*, to which we are indebted for our illustration, the goods are first boiled in an alkaline solution, and washed. They are then placed in an air-tight keir connected on the one hand with a vessel containing the bleaching solution, and on the other with a gas holder containing the carbonic acid gas.

In the annexed engraving we illustrate the apparatus by means of which the success of the process was practically demonstrated on a working scale, and which is capable of treating 100 yards of cloth. In our engraving, A represents the bleaching keir, B the gas holder, C the vessel containing the bleaching solution, D the carbonic acid gas generator, E the wash bottle containing water for the purpose of cleansing the carbonic acid gas as generated, F the gas pipe leading from the holder to the keir, G the pipe through which the chlorine solution is pumped into the keir, H the force pump, K the siphon pipe through which the chlorine solution is run from the keir back into its tank, and which prevents the escape of the carbonic acid gas with which the keir is filled after the chlorine solution has been drawn off. The mode of working the apparatus is as follows: After the material to be bleached

© 1884 SCIENTIFIC AMERICAN, INC

has been boiled or "bowked" in the ordinary way, and washed, it is piled in the bleaching keir precisely as it is piled in the chemicking vat in the ordinary process. The cover is then secured and the keir made air-tight, the valve on the pipe, F, being closed. An air tap in the cover is opened, and the bleaching solution is forced into the keir until it is quite full, thus expelling the air. The air tap is then closed, and the valve on the pipe, F, opened.

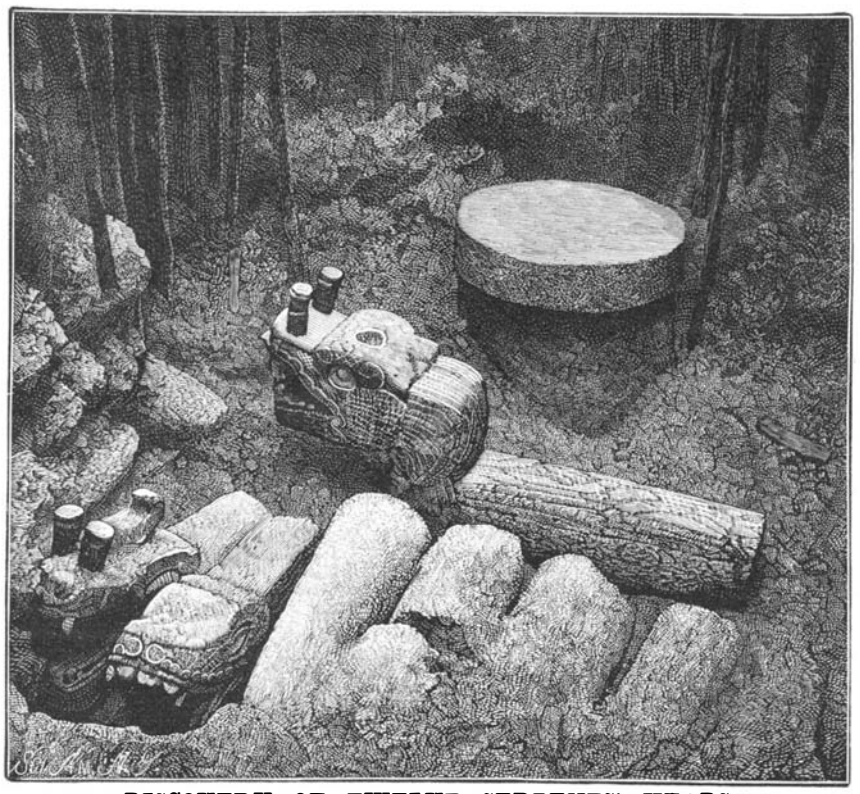
After the bleaching solution has remained long enough in the keir to enable the material to be thoroughly soaked, and which is about five minutes, the liquor is drawn off through the pipe, K, into the vessel, C, and the valve at J being open, the gas under pressure of the water in the upper part of the gas holder follows the retreating liquor. The gas remains in contact with the moistened material for forty-five minutes, by the end of which time it will have decomposed the whole of the chloride of lime in the bleaching solution on the fiber of the cloth. The bleaching liquor is again run in upon the material in the keir, thus forcing the carbonic acid gas back into the gas holder; but which again returns when the liquor is run out. This alternating of bleaching liquor and gas is repeated till the material is of sufficient whiteness. For a medium grade of cloth, provided it has been boiled three hours, it will take about eight hours to bleach, but if the cloth has not been boiled the bleaching will require a longer time. When the bleaching in the keir is finished, the material is thoroughly washed, after which it is slowly passed through the solution of triethylrosaniline and again washed, when the process is complete. The total time occupied ranges from eight to twelve hours, according to the nature of the fabric under treatment.

From what we have stated it will be clear to the practical mind that the great value of the process arises from the circumstance that the two operations of chemicking and souring, which have hitherto been carried on separately, are here performed simultaneously. The value and importance of the invention are, moreover, further enhanced by the fact that a great reduction in the wear and tear of the fabric under treatment is secured. Of the results of Mr. Thompson's invention we may write with confidence, for it has passed the experimental stage, and has entered the region of practice. It has been proved on a practical scale at the Halliwell Bleach Works of Messrs. R. Ainsworth, Son & Co., near Bolton, England. Respecting the theory upon which the process is based there never has been any question, namely, that by the reaction of carbonic acid on chloride of lime vegetable fiber is readily bleached. The point to be settled, however, was whether the carbonic acid gas could be made to penetrate to the center of a large body of cloth, that is, whether it would penetrate to the center of an ordinary keirful of cloth, say about 30 cwt., piled or laid in the usual manner. This Messrs. Ainsworth find is really done, even under disadvantageous circumstances in connection with the first apparatus erected at their works, and which proved slightly defective, but which defects are being remedied in the permanent plant now being laid down. Messrs. Ainsworth state that the carbonic acid gas does penetrate to the center of the goods in the keir, so that the entire contents are perfectly bleached. This point regarding penetration having been satisfactorily settled, we have now only to consider those respecting the saving of time and expense. The question of time we have already dealt with, while with that of cost we leave Messrs. Ainsworth to deal. They state from experience that the cost of bleaching one ton of cloth by the Thompson process is under 30s. for chemicals, labor, and coal. Although there is some little difficulty in arriving at a precise estimate of the cost of bleaching by the ordinary process, our practical readers will agree with us in placing it at from £4 to £6 per ton. The saving will, therefore, be seen to be at the worst very considerable, and at the best 75 per cent. If we place it at 50 per cent, we believe we shall be well within the mark. Without doubt Mr. Thompson deserves credit for so ingenious an invention, and Messrs. Ainsworth for the spirited manner in which they have given it its initial start in practice. They have shown it to be a thorough success, and there is every reason to believe that it will prove of incalculable benefit to the bleaching trade.

DR. LE PLONGEON'S LATEST AND MOST IMPORTANT DISCOVERIES AMONG THE RUINED CITIES OF YUCATAN.

(*Continued from page* 311.)

The stones and mortar having been cleared away, it was found that the statue had rested on conoidal stone pillars, placed horizontally side by side. Some were painted blue, others red, one meter high, and thirty centimeters in their thickest diameter; blue, by the bye, was the color of mourning among the Mayas, and was also a color much used at Egyptian funerals in ancient times, according to Sir Gardner Wilkinson.



DISCOVERY OF TWELVE SERPENTS' HEADS.

PIECE OF JADE.

THE SERPENTS' HEADS AND ROUND URN.

The pillars on which the statue rested were not the only ones; they extended over a space of about eight square meters, and in some places were three and four deep, the total number being 182, half the number of the days in our year, less half a day Two-thirds of the pillars are painted blue, and one-third red; they vary in height from eighty centimeters to 1 meter 25 centimeters. On a level with the pillars were twelve serpent heads, with feathers and many designs exquisitely sculptured all over them. Two large ones, and two small, looked toward the east, northeast, and southeast. Three on the west side of the excavation looked west, and three on the south looked south, and two others southeast. From the top of each head rises a kind of plume or perhaps flame; and on each side of the front of the head perpendicular ornaments, like horns, that we have discovered represent the opening pod of the *Ceiba* tree, sacred to the Mayas. Their ideal heaven was to rest beneath the shade of the *Yaxche* (*Ceiba*), eating sweet things, and enjoying the happy do-nothing. The opening pod of that tree, with the silky filament coming forth, served as models for the scepters and badges of authority seen in the hands of the chiefs whose stone likenesses adorn the buildings.

The feathers carved all over the upper part of the body of the stone serpents are painted green; the scales of the belly, well defined, are yellow, as also the edge of the jaws. The inside of the mouth and forked, projecting tongue are red, like the gums, though the teeth and fangs are white. Blue paint is round the eyes and over the brow. The whites of the eyes were made of shell, that had a round hole where the pupil should be. Perhaps the pupils were made of some brilliant stones that were removed when the stones were interred, for nothing that might have served such purpose has come to light. The horn-like ornaments on the front of the head are painted green and tipped with red, which is the color of the feather on the top. The largest head measures fifty centimeters in length, thirty-five from top to lower jaw, and twenty-five across the top. Unhappily, we found nearly all of them more or less broken; they are of soft limestone, but we also found the pieces, so they could be mended; they were undoubtedly broken at the time of making the mausoleum.

On the south side of the excavation, at the feet of the statue, but lower down, was a round, white stone urn that measures outside 80 centimeters in diameter and 70 in depth, with the lid that is 17 centimeters thick. The diameter of the interior is 55 centimeters, and the depth 28. With difficulty four men were able to slide off the lid. Then, at first sight, the urn seemed empty, except a little red earth in the bottom, but feeling among it, we found a trapezoidal piece of green jade, 6 centimeters long, 4 wide, and 1 centimeter thick. The jade stone was held in great esteem by the Mayas, as it is to-day by the Japanese. On one side of the piece found in the urn there is a human face—full face—and letters round it; it is well carved and highly polished. Besides this, we found in the urn a tube-shaped jade ornament, nearly 3 inches long, one end of which broke to pieces when we touched it. Also two pieces of the same stone, that look like halves of pierced ornaments, and a ball of white glass nearly an inch in diameter. We took all the dust that was in the urn, and with some trouble separated from it many small pieces of shell or bone, and some seem to be enamel, painted red and green, and cut in various shapes, having served to form mosaic work. The ball of white glass is very interesting, proving that those people were acquainted with glass, and probably knew how to make it, At the time of the Spanish conquest looking glasses were in use among the Mayas, for the historians inform us that *only the men used them.* When the glass ball was taken from the urn, the Indian workmen said: "Holo! zazteen!" ("Here, the transparent stone.")

Effectively, even to-day, there are people among the Indians of Yucatan who call themselves *H-men* (*m*) and *X-men* (*f*). The letter *H* before the word *men* is a contraction of the masculine article *Ah*, and the *X* a contraction of the feminine article *Ix*, which is pronounced ish; and as the *i* in Maya is like the English *e*, it is the feminine article *she* reversed. The *H-men* and *X-men* (wise men and women) use stones like the glass ball found, and in them pretend to see hidden things and coming events; so we may presume that clairvoyance was known among the Mayas; and Bishop Landa, in his work on Yucatan, tells us that soothsayers, who pretended to read futurity, formed part of the priesthood.

After the serpent heads and urn were removed from the

© 1884 SCIENTIFIC AMERICAN, INC

mound, with all the loose mortar and stones, we stand on a level floor, sixty centimeters below which was a small pile of bones, with one smoke-colored obsidian arrow head, twelve centimeters long, on each side of it. Also fragments of fine pottery, some painted blue inside, the others with vestiges of a design in white.

Though the bones had been completely protected from the air, they were so rotten that we had to handle them with care for them not to fall to dust. They seem to have belonged to a small animal with long and pointed jaws and very pointed teeth. We wrapped each bone in a separate paper, so that later some qualified person might examine them. Forty centimeters below these bones and arrowheads was a concrete floor beautifully leveled and painted bright red, which extended throughout the mound. Below this floor were loose stones without mortar to a depth of forty centimeters, then another floor painted yellow, making the seventh floor from the summit, though the upper floors were not polished like those beneath. Under the seventh floor there were more loose stones, sixty centimeters deep; then solid rock and Mother Earth. We next had the men to open further into the west or rather southwest part of the mound, in which direction the arrowheads had pointed, and after three days, reached a very solid block of masonry. Within it, about a meter and a half west of the center of the mound, was a stone seventy-five centimeters long and sixty-five wide, standing upright, its surface facing east.

The stone is deeply carved with signs that had their meaning among the Maya priesthood, and painted blue, yellow, red, and green. Further south, two other similar stones were found face downward, on the red concrete floor; they were stood up, together, and a photograph made of them. There, also, was another stone with a fish sculptured on it, the fish being surrounded by a fold of a serpent's body. No other object was found in this mausoleum, that seems to have been erected to the memory of a certain priest or wise man, called Cay Canchi, and also to conceal the remnants of some sacred temple that may have been destroyed by a great cataclysm; in which case we may presume that the apish figure was a principal and much respected object in that temple, and the property of the pontiff, since he inscribed his name (Cay Canchi) on the heel of the sandal; for we are not very ready to admit that the figure found is a likeness of a sage and philosopher—a learned man of the highest class, a nobleman among the Mayas.

The great statue that was thrown from the top of the mound and broken may have been a picture of Cay Canchi; we cannot now tell; but no image of him was within the mound. We have found an exquisite stone bust of that individual in Uxmal, but have left it concealed where found, because in Mexico no one would know how to appreciate it, and we are not allowed to carry any stone from the country out of Mexico. Even though we give them being by bringing them to light from the bowels of Mother Earth, we cannot call them ours, neither will the government pay us one cent for our discoveries, that is well able to make its museums the richest, *in American antiquities*, that exist in any country; but it seized the statue of Chaacmol, and refused to defray the expenses incurred in the discovery. Even the Congress at Washington refused to aid Dr. Le Plongeon in the recovery of his expenses, when Hon. George Hoar appealed for protection to the Senate in a paper marked, "*Confidential*. 45th Congress, 2d session. Executive B. May 7, 1878." It seems that in America people who dedicate themselves to science, unless happy enough to be rich, run a good chance of starving, so far as the governments are concerned.

Your most obedient,

ALICE D. LE PLONGEON.

Ruins of Chichen Itza, Yucatan, January 12, 1884.

The Corinth Canal.

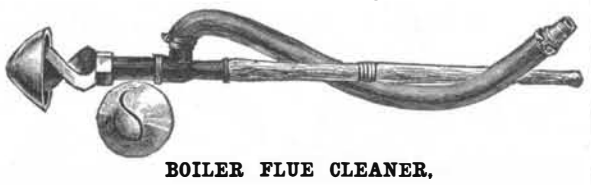
The work of making a ship canal across the Isthmus of Corinth, to connect the Gulf of Corinth with the Bay of Ægina, is now well under way, although, short as will be the route, it is expected that four or five years will be required for the completion of the undertaking. The total length will be 6,400 meters, or about four miles, and the route is on a line where a canal was once projected, and the excavation even begun, by the Roman Emperor Nero. The canal will be the same in section as the Suez Canal, 22 meters in width at the bottom, and 8 meters in depth at low tide, but the total amount of material to be removed is placed at 10,000,000 cubic meters.

A correspondent sends us an opinion as to the benefits this canal will confer upon navigators of that portion of the Mediterranean, and estimates that the tonnage of vessels likely to use the canal will be at least six and a half million tons yearly, yielding a revenue, on moderate charges, of about $900,000 a year above charges for running expenses and maintenance. Full details of the work, showing plan and birdseye view of the route, with sectional elevations, may be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 425.

JOHN E. WOOTTEN, General Manager of the Philadelphia and Reading Railroad Company, who is the patentee of the Wootten dirt burning locomotive, has sold his rights in the patent for a sum estimated between $250,000 and $300,000. The purchase was made by an association of railroad capitalists, who formed a company, of which Mr. Jos. Wharton, president of the Wharton Switch Company, is the leading man.

BOILER FLUE CLEANER.

Keeping the flues clean is one of the most important duties connected with a boiler; when properly performed, it results in a decrease in the expenditure for both fuel and repairs and an increase in efficiency. One of the best tools for doing this work is the cleaner shown in the accompanying engraving, and which is manufactured by the Crescent Manufacturing Company, of Cleveland, Ohio. The form of the cleaner is shown in the cut. A hose connects the cleaner with a pipe that leads to the dome of the boiler, in order to obtain dry steam. The conical shaped head of the cleaner adjusts itself to the ends of the tubes, excluding the air, thereby preventing condensation and insuring a dry current of steam. The steam passes through the auger-shaped passage, which is without obstruction from the induction end to the outlet, and is delivered directly against the face of the tubes in an unbroken sheet, continuing through the entire



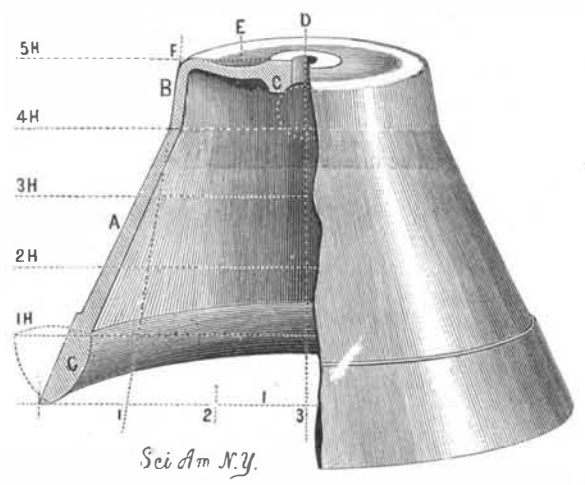
BOILER FLUE CLEANER.

length in a whirling motion, and thoroughly removing all ashes and other foreign matter. The cleaner need be held against the end of each tube only for a few seconds, so that every tube in the boiler can be cleaned in a short time. There are no parts needing attention, and the apparatus is ready for use at all times. For these reasons the tubes can be more frequently cleaned, thereby preventing the formation of scales, improving the draught, and permitting the use of a poorer grade of fuel.

The above mentioned firm also manufactures the "Crescent" steel tube scraper and boiler compound for dissolving scale and preventing its formation.

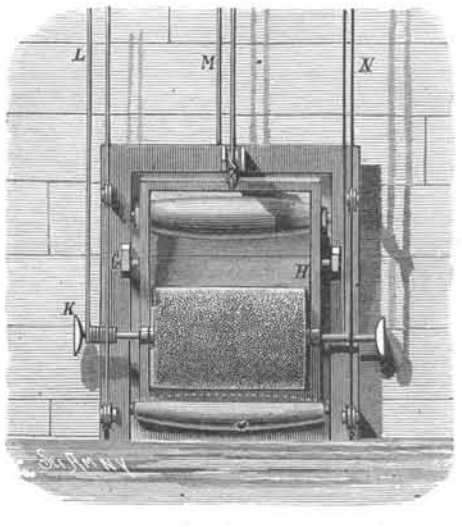
IMPROVED FORM OF BELL.

An improved construction of farm, factory, church, and other bells, whereby greater vibration is secured for the upper portion of the bell, a more powerful tone is obtained,



BOWERS' IMPROVED FORM OF BELL.

and the bell is less liable to break from strain of metal in casting, has been patented by Mr. M. M. Bowers, of 29 Camden Street, Baltimore, Md. The body of the shell is in the form of a truncated cone whose height from 3 to 4 H is equal to half its base, and its top also equals half its base. The head portion is one-fourth the height of the cone. The base line of the cone is divided into six equal parts, and from 1 and 5 are drawn upwardly converging lines to and through the top circle. This gives the proper slope of the head. The exact form of the upper part of the head is clearly shown in the engraving. The whole height of the shell of the bell is divided into five equal parts as shown by the dotted lines, 1 H to 5 H. The hammer swell is made wholly within the shell, and its length is limited by the first of the five spaces. By concaving the top of the head,



COOPER'S NEW SHIP CLEANER.

greater ease is secured for the vibrations of the shell, and there is less strain of the metal in casting. The form of the hammer swell and its arrangement within the shell, instead of outside, have a greatly improved effect.

Canned Goods and Adulterations.

A bill was recently proposed in the New York Legislature requiring all canned goods sold in the State to be stamped with the date of packing. The proposition was vigorously opposed by those interested in the canning interest, and did not become law. The annual production in this line in the United States—in fruit, meat, fish, and vegetables—is placed at 500,000,000 tins, or about ten for every man, woman, and child in the country, and such a law, it was claimed by the manufacturers and dealers, would seriously check if not destroy a now prosperous business.

It is not strange, however, considering the many forms of adulteration and sophistication in articles of food which have grown up in a few years past, that people are very open to suspicion, and sometimes propose severe remedies. A great deal of glucose was sold in sugar and sirup and as honey before people suspected it, and the war between oleomargarine and butterine and dairy butter seems now to be further than ever from a settlement, on account of the passage by the Legislature of a law generally deemed unconstitutional. The latest of these most conspicuous adulterations has been found in the recently discovered adulteration of green coffee by New York and Brooklyn dealers. The cheap Maracaibo and Guatemala coffees differ in appearance from the more valuable Java and some other varieties, the former being of a dull greenish hue and without luster, as compared with a glossy yellow color in the Java. Thence was started a practice of treating the cheaper coffees by rolling the former in heated cylinders and sprinkling with gum arabic water, to polish the beans and give them more the appearance of Java. After this came the use of other coloring matters, and the officers of the Sanitary Bureau state that now both arsenic and lead are used for this purpose, as well as chrome yellow, Prussian blue, yellow ocher, umber, Venetian red, and lampblack. The coffee dealers say the injurious articles are used in quantities so infinitesimal that no harm can possibly come of their employment, but this is a statement of which the public may well be highly incredulous; the coloring matters have been used simply and only as a means of palming off a cheaper article for a better, and the health officers have concluded that every cup of coffee made from the colored beans contains one-sixtieth of a grain of arsenious acid, a virulent poison. In buying coffee and many other articles of consumption the consumer will do well to be on his guard.

Brass Driving Boxes.

The practice of the Baltimore & Ohio road in the matter of solid brass driving boxes presents some advantages, a knowledge of which may be useful to other roads that have brass foundries and make their own brass castings. These boxes are charged upon this road at 16 cents a pound, which is the ordinary rate for all brass work, and the old brass is received back by the foundry and credited at 11 cents per pound. The boxes can be finished up at about half the cost of finishing cast iron boxes, and being solid no labor is expended in fitting a brass into the box. It has been found that these boxes, when made of the right mixture, will wear as long as combination boxes. When an accurate system of accounts is kept, with a knowledge of every source of waste in the foundry, there are many parts of an engine which can be made from solid brass more economically than from a combination of brass and iron. The loss in remelting being known, together with the cost of the raw material and of the labor expended in the process of making and turning out, it is easy to determine what iron castings can be economically replaced with brass. But if the attempt is made to substitute brass for iron without an accurate knowledge of the details of expense, it is easy to make mistakes that will be wasteful instead of the contrary.

A NEW SHIP CLEANER.

The construction of the ship cleaner recently patented by Mr. J. L. Cooper will be plainly understood from the accompaning engraving. A steel brush, whose shaft is journaled on a movable frame, H, which is pivoted in blocks projecting from the main frame, is made to revolve by means of two ropes wound in contrary directions upon the ends of its shaft. These ropes may be operated from any convenient station—either from the deck, the dock, or a float. From the sides of the main frame project four arms, each of which is furnished with two wheels, between which pass the tightly drawn guide ropes. These ropes can be carried down one side of the ship, under the bottom, and up the other side. The frame is kept a short distance from the surface to be cleaned by rollers. The apparatus can be readily raised or lowered, or moved sidewise, so as to bring the brush against any part of the ship's surface. By the aid of a rope attached to the upper cross bar of the movable frame the pressure of the brush against the ship can be regulated. With this device the sides and bottom of a vessel can be quickly gone over, and barnacles, rust, paint, etc., removed.

Further particulars concerning this useful invention can be obtained by addressing Mr. James O. Cooper, No. 165 Fourth Street, Portland, Oregon.

ON his way to the Cape, Captain Gordon landed at the Seychelles Islands. There is a curious grove of palms there which grow in pairs, side by side. If one is cut down, the other dies. Gordon at once indicted an official dispatch to say that he had discovered the original Garden of Eden, and that trees of good and evil were still flourishing in it.

© 1884 SCIENTIFIC AMERICAN, INC

Inhalations of Oxygen.

For several years past numerous experiments carried out with the view of ascertaining the influence of various gases on the system have occupied many distinguished physicians. Baths of compressed air for asthmatic patients are now quite fashionable in certain French and German towns.

The most important investigation of this kind, which has come to light quite recently, is that of Dr. Albrecht, of Neuchatel, the object of which is to determine the exact value of methodic inhalations of oxygen gas in phthisis, or tubercular consumption.

The observations made in this direction are certainly encouraging, to say the least, and no one can say to what beneficial results they may not lead before long.

The author is medical tutor at the Children's Hospital at Bern (the Children's Clinic at the University), and he has already devoted some time to noting the influence of pure oxygen upon nutrition, and especially upon the formation of the red blood corpuscles. In the work Dr. Albrecht gives an account of his experiments made both on men and animals, with the view of ascertaining the effects of methodic inhalations of oxygen gas upon the development of phthisis. He wished to prove whether by increasing the rate of organic combustion by this means the bacterium of consumption (Koch's bacillus) would not be destroyed and eliminated from the system.

In experimenting upon the human subject, Dr. Albrecht submitted his patients to the inhalations of oxygen; they were tuberculous patients, in whose expectoration the bacterium of phthisis had been discovered with certainty on several occasions. Before this treatment was put into operation the patients were submitted to an appropriate highly nutritious diet, such as would not require to be changed during the course of the experiment. The diet consisted of milk and peptone. Twice in the course of a week they were weighed with the greatest care, and the smallest variation in the weight of the body was noted.

One of the first things observed was that as soon as the patients had begun the oxygen inhalations the loss of weight which the body was undergoing day by day was checked, and sometimes the patient's weight was found to have increased. At the same time it was noticed, though not so constantly, that dyspnœa diminished, and the number of bacteria seen under the microscope appeared smaller.

It was quite evident that the improvement noticed in the state of the patient was due to the oxygen inhalations; for no sooner were these suppressed than the suffering and dyspnœa recommenced, even when the body still kept up the weight it had acquired during the previous treatment.

Successful Experiment in Draining Swamps.

In a letter from Atlanta, Ga., to the N. Y. *Sun*, a correspondent relates the result of some experiments recently made by Col. John P. Fort, on the draining of swamp lands in the southwestern portion of Georgia.

The great drawback of Florida, Louisiana, the rice sections of South Carolina, and Georgia has been the fact that white men could not live there on account of brackish drinking water and malaria, inseparable from floods and swamps. Several years since, Col. Fort, who owns much property of this description, conceived the idea of sinking artesian wells, holding that when a certain stratum was reached pure water could be obtained in abundance. His efforts were crowned with such success that every town in southern Georgia is sinking artesian wells. The water is perfectly clear, sweet, and pure as the best to be found in the highlands. This success led Col. Fort to try the experiment of draining stagnant ponds by running them off through subterranean passages that are known to exist at a distance of from 70 to 100 feet below the surface.

Col. Fort's experiment was made on his hickory level plantation, in Dougherty County, and the pond upon which he experimented is situated about 200 yards from his pioneer artesian well. The pond covered an area of about two acres, with a depth of 10 feet in the center. To drain it thoroughly an outlet must be made in the deepest part. To accomplish this, Col. Fort bound four substantial pieces of timber together, floated them over the center of the pond, and upon this foundation built his raft or pen, which sank as it was added to. When the raft had been built, the foundation resting on the bottom of the pond, the platform was placed across the top, and on this platform a derrick was set up. To this derrick boring apparatus was attached. At first a pile driver was used, but when the pipe had been driven down through the bottom of the pond to a depth of 30 feet, it rested on solid rock, and then the work of drilling and boring was begun.

At a depth of 50 feet below the bottom of the pond the drill struck an opening, and at once the water commenced to sink with a roar through the big pipe, the top of which was only a few inches under water. The drill pipe was drawn out, and the pond commenced to empty itself as fast as the orifice that the drill had made through the rocks would permit the water to flow. When the water in the pond was level with the top of the pipe, a reamer was attached to the drill pipe and sent down to open the way for the big pipe to be sunk deeper. In this way the pipe was sunk until a joint of two sections was almost level with the bottom of the pond, and there it was unjointed.

Col. Ford will have a square pit dug around the pipe, and the pipe will then be driven down to a level with the bottom of this pit. The top of the pipe will be covered with wire to keep trash out, and the pit will be filled with rocks, and thus the drain will be kept open. This strange scene of emptying the pond into subterranean channels has been witnessed by hundreds of people, who see in it the reclamation of the millions of acres of swamp lands in the South. Thus, within 200 feet of each other were two pipes—that of the artesian well throwing up the purest of drinking water, and that in the middle of the pond sucking stagnant water into the bowels of the earth and carrying it away. The experiment cost only $75, while there was gained from it over 2,000 tons of compost soil.

The Progress of Pisciculture.

Of late years, no feature of fishery economy has excited more attention than the progress we have been making in what is called "pisciculture." Fish eggs are now a common article of commerce—the sales of which, and the prices at which they can be purchased, being as regularly advertised as any other kind of goods. This is a fact which, a century ago, might have been looked upon by our forefathers as something more than wonderful. Such commerce in all probability would have been stigmatized as impious, as a something "flying in the face of Providence."

But in another country there was buying and selling of fish eggs more than a thousand years ago. The ingenious Chinese people had discovered the philosophy which underlies fish culture, as well as the best modes of increasing their supplies of fish, long before any European nation had dreamt of taking action in the matter. A few years ago, a party of fisher folks from the Celestial Empire, on a visit to Europe, were exceedingly astonished at the prices they had to pay for the fish they were so fond of eating. They explained that in China any person might purchase for a very small sum as much as might serve a family for a week's food. They also mentioned that some fishes which we reject, such as the octopus, were much esteemed by the Chinese, who cooked them carefully, and partook of them with great relish. The capture of the octopus, indeed, forms one of the chief fishing industries of China, these sea monsters being taken in enormous numbers at some of the Chinese fishing stations, notably at Swatow. They are preserved by being dried in the sun; and then, after being packed in tubs, they are distributed to the consuming centers of the country. In the inland districts of China there are also to be found numerous fish ponds, where supplies of the more popular sorts of fish are kept, and fed for the market. These are grown from ova generally bought from dealers, who procure supplies of eggs from some of the large rivers of the country. The infant fish, it may be mentioned, are as carefully tended and fed as if they were a flock of turkeys in the yard of a Norfolk farmer. In the opinion of the Chinese fishermen, who were interviewed by the industrious Frank Buckland, hundreds of thousands of fish annually die of starvation; and if means could be adopted for the feeding of tender fry, fish of all kinds would become more plentiful than at present, and we would obtain them at a cheaper rate. In China, the yolks of hens' eggs are thrown into the rivers and ponds, that kind of food being greedily devoured by the young fish.

It has long been known to those interested in the economy of our fisheries, that only a very small percentage of the ova of our chief food fishes comes to maturity, while of the fish actually hatched a very small percentage reaches our tables for food uses; hence the desire which has arisen to augment the supplies by means of pisciculture. In the case of a fish like the salmon, every individual of that species (*Salmo salar*) which can be brought to market is certain, even when prices are low, of a ready sale at something like a shilling per pound weight; and it is not, therefore, to be wondered at that the proprietor of a stretch of salmon water should be zealous about the increase of his stock of fish.

It may prove interesting to state the prices which are charged usually for ova and young fish. A sample lot of eyed ova of the American brook trout, to the extent of one thousand, may be obtained for thirty shillings; and for ten shillings less, a thousand eggs of the Loch Leven trout, or the common trout of the country, may be purchased. For stock supplies, a box containing fifteen thousand partially eyed ova of *S. fontinalis* (American) may be had for ten pounds. The other varieties mentioned are cheaper by fifty shillings for the same number. Fry of the same, in lots of not fewer than five thousand, range from seven pounds ten shillings to five pounds. Yearlings are of course dearer, and cost from fifteen and ten pounds respectively per thousand. Ten millions of trout ova are now hatched every year at the Howietoun fishery.

The fecundity of all kinds of fish is enormous. A very small trout will be found to contain one thousand eggs; a female salmon will yield on the average eight hundred ova for each pound of her weight; and if even a fifth part of the eggs of our food fishes were destined to arrive at maturity, there would be no necessity for resorting to pisciculture in order to augment our fish commissariat. But even in America, where most kinds of fish were at one period almost over abundant, artificial breeding is now necessary in order to keep up the supplies. In the United States fish culture has been resorted to on a gigantic scale, not only as regards the salmon, but also in connection with various sea fishes, many hundred millions of eggs of which are annually collected and hatched; the young fry being forwarded to waters which require to be restocked. Apparatus for a proper description for the hatching of sea fish has been constructed, and is found to work admirably. Some of these inventions were shown last year, in the American department of the International Fishery Exhibition, where they were much admired by persons who feel interested in the proper development of our fishery resources. In the United States, the art of pisciculture has been studied with rare patience and industry, the fish breeders thinking it no out-of-the-way feat to transplant three or four millions of young salmon in the course of a season. In dealing with the shad, the United States Commission of Fish and Fisheries have been able to distribute the young of that fish by tens of millions per annum; the loss in the hatching of eggs and in the transmission of the animal being very small.

Some writers and lecturers on the natural and economic history of our food fishes have asserted that no possible demand can lead to their extermination or to any permanent falling off in the supplies; but the economy of the American fisheries tends to disprove that theory. In the seas which surround the United States, certain fisheries would soon become very scarce, were the supplies not augmented each season by the aid of the pisciculturists. The fruitfulness of the cod is really wonderful, individuals of that family having been taken with from five to nine millions of eggs in their ovaries. The fecundity of the common herring, too, has often proved a theme of wonder. That an animal only weighing a few ounces should be able to perpetuate its kind at the rate of thirty thousand, is indeed remarkable. But fruitful in reproductive power as these and other fishes undoubtedly are, it has been prophesied by cautious writers, that by over fishing the supplies may in time become so exhausted as to require the aid of the pisciculturist. If so, we believe the mode of action which has been found to work so well in the American seas will be the best to follow. No plan of inclosed sea ponds, however large they might be, will meet the case; the fish eggs will require to be hatched in floating cylinders specially constructed for the purpose, so as to admit of the eggs being always under the influence of the sea water, and at the same time exposed to the eye of skilled watchers. It is believed by persons well qualified to judge, that the eggs of our more valuable sea fishes may in the way indicated be dealt with in almost incredible numbers. We have only to remember that twenty females of the cod family will yield at least one one hundred millions of eggs, to see that the possibilities of pisciculture might extend far beyond anything indicated in the foregoing remarks.

In resuscitating their exhausted oyster beds, the French people have during the last twenty years worked wonders; they have been able to reproduce their favorite shell fish year after year in quantities that would appear fabulous if they could be enumerated in figures. Pisciculture was understood in France long before it was thought of as a means of aiding natural production in America; but our children of the States—to use a favorite phrase of their own—now "lick all creation" in the ways and means of replenishing river and sea with their finny denizens.—*Chambers's Journal.*

New Method of Producing Steel Plates.

Dr. Henry Muirhead, President of the Physiological Society of Glasgow, has recently brought before that body some particulars of a method of manufacturing steel plates for shipbuilding and boilermaking purposes which is of much interest, although its leading feature is not a novel one. It is the invention of Mr. Joseph Whitely, of Leeds, who has erected works for prosecuting the manufacture. Briefly describing the process, Dr. Muirhead said, a hollow metal cylinder, lined with ganister or other brick, revolves at high speed, the axis being horizontal. A gutter or rhone perforated with holes passes into the interior, along its whole length. Into this gutter is poured molten mild steel, which, escaping through the holes, is carried round by the swiftly revolving case, and is formed into an inner cylinder of steel of an inch or more in thickness. This cylinder, while still hot, is drawn, cut across by means of a saw, put into a rolling mill, and rolled to the length and thickness required. In his communication to Dr. Muirhead on the subject, Mr. Whitely wrote as follows: "Suppose I wish a plate for shipbuilding; then, given a mould 5 feet in diameter and 5 feet long, in it I cast a cylinder an inch thick. This when taken out and cut is fully 15 feet long and 5 feet broad. It is then rolled down to half an inch in thickness. Such a plate is then 30 feet long and 5 feet broad. The present mould is 9 feet long and 5 feet in diameter. With it, yesterday (Friday, 7th March) I successfully cast a mild steel shell weighing about 30 cwt."

A New Gelatin Mass for Hectographs.

The French Ministry of Public Works publishes a formula for a hectograph or gelatine pad which is said to produce very satisfactory results. The composition consists of 100 parts of good, ordinary glue, 500 parts of glycerine, 25 parts of finely powdered baric sulphate, or the same amount of kaolin, and 375 parts of water. For the copying ink a concentrated solution of Paris violet aniline is recommended. To remove the old copy from the pad, a little muriatic acid is added to the water, washing it gently with this liquid by means of a soft rag, afterward using blotting paper for removing superfluous moisture.—*New Remedies.*

To Destroy Red Ants.

Grease a plate with lard, and set it where ants congregate; place a few bits of wood so the ants can climb on the plate easily; they will forsake any food for lard; when the plate is well covered with them, turn it over a hot fire of coals; they will drop into the fire, and you can then reset the plate for another catch. A few repetitions will clean them out.

© 1884 SCIENTIFIC AMERICAN, INC

ENGINEERING INVENTIONS.

A propelling apparatus for vessels has been patented by Mr. Alonzo Cardoso de los Rios, of New Orleans, La. This invention relates to screw propellers for vessels, the propellers being made with a comparatively long axis and spiral leaves, and being either cylindrical or conical; a special description of forefront of the vessel is also provided for.

A railway switch signal has been patented by Messrs. Joseph W. Alexander, of Frazerville, Quebec, and Marshall Wheelhouse, of Campbellton, New-Brunswick, Canada. This invention covers improved means for carrying and operating three-throw switches by one lever with interlocking devices, which automatically lock the signals in position and unlock them for shifting.

A steering gear for traction engines has been patented by Mr. Albert P. Broomell, of York, Pa. This invention consists in certain combinations of bevel gears and friction driving devices connected with the motor shaft and the reversing shaft, by which motion is transmitted to the steering devices, whereby great efficiency and smoothness of action is obtained, and the machinery is free from much or all liability to breakage.

A steam engine has been patented by Mr. William Golding, of New Orleans, La. The invention consists mainly in grouping engines into pairs, connected with progressively arranged cranks on two independent shafts geared with and rotating a main driving or combined engine shaft, so the initial and diminishing pressures of the steam, working expansively, are made to produce a uniform effect from the order in which the greater and lesser pressures follow each other in the several cylinders.

MECHANICAL INVENTIONS.

A locomotive frame forging die has been patented by Mr. Thomas Morris, of Dunkirk, N. Y. This invention relates to a holding die or bed adapted to hold the leg and brace forgings of locomotive frames while welding upon said forgings the top connecting bar.

A saw mill feed mechanism has been patented by Mr. Edwin T. Gardner, of Rocky Mount, N. C. This invention covers a peculiar construction and arrangement of parts to facilitate running the saw log carriage back and forth, and for regulating its speed at will.

AGRICULTURAL INVENTIONS.

A fertilizer pulverizer and distributer has been patented by Mr. Charles F. Dinkle, of Carlisle, Pa. It is designed to attach the pulverizer to machines used for planting seeds, the attachment to be so made that the fertilizer will pass from the pulverizer into and go with the seed discharged from the planter.

A fertilizer distributer has been patented by Mr. Benjamin F. Archer, of Marietta, Miss. This invention covers a novel construction of wheeled distributers, the axle carrying a distributing toothed roller, the hopper having two compartments, there being a hinged grating in the upper one, and there being also a spring scraper, with other novel features.

A check row corn planter has been patented by Messrs. Valentine Weber and John Friedman, of Princeville, Ill. The wheels and axle and the seed dropping slide are connected by a trip wheel with arms and rollers operating a vibrating double cam, with other special details, to facilitate planting in accurate check row.

MISCELLANEOUS INVENTIONS.

An improved gate has been patented by Mr. Adelbert D. Mack, of Franklin, O. The invention covers a novel construction of sliding and swinging gate, in which the weight of the gate can be taken from the swinging crane when the gate is open or closed.

An improved saw has been patented by Mr. Harvey W. Peace, of Brooklyn, N. Y. The invention provides for such a form of making saws that the blade can be readily detached from the handle, thus facilitating the interchange of blades.

A holder for ornamental and fly paper has been patented by Mr. Vurlin G. Tansey, of Louisville, Neb. The invention consists in a frame, with a series of spring frames, and with a series of cords extending from the outer rod of the frame to the inner plate, from which cords the paper is suspended.

A collar button has been patented by Mr. George Krementz, of Newark, N. J. The invention provides for making a collar button with a hollow head and stem, and formed and shaped out of a continuous plate of sheet metal, being simple in construction, strong, and durable.

A soda water apparatus has been patented by Mr. Achille Bertelli, of San Francisco, Cal. The invention consists in an apparatus for generating carbonic acid gas adapted to be placed directly on a fountain, or that can be coupled with a series of fountains for charging them.

A miter box has been patented by Mr. Joseph Cashin, of Washington, D. C. This miter box is so constructed that with a hand saw, without the addition of an extra back, it may be used for cutting any depth desired, and the device may be adjusted to any thickness of saw.

An adjustable keel block has been patented by Messrs. Frederick C. Lang and John F. Tietjen, of Rondout, N. Y. The invention covers a peculiar arrangement of inclines or wedges, so that vessels may be more firmly supported in dry docks, whether or not the keels of vessels are more or less out of line.

An automatic electric circuit closing device has been patented by Mr. Charles T. Ross, of New York city. The device is more especially intended for use in connection with fire alarms, and is arranged for normally breaking the circuit, but adapted to close the circuit automatically, at a given temperature.

A sash cord fastener has been patented by Mr. S. Howland Russell, of New York city. This invention covers a cord fastening with a plate perforated to receive the fastening screw, and with two or more points having inclined inner sides, so the cord may be compressed between the points and around the fastening screw.

A holder for use in carving meat has been patented by Messrs. Louis Chevalier and Leon Graillot, of Paris, France. The holder is composed of a sheath in a suitable handle, with jaws grooved on their inner faces, and blades acting as springs, so that the bone of a cutlet, or meat in other form, may be grasped and held when removing the meat therefrom.

A bottling machine has been patented by Mr. John C. Blair, of Louisville, Miss. The invention covers special peculiarities of construction, by means of which a very simple and efficient machine is obtained, the precise amount of liquid for each bottle being easily gauged, and the filled bottles removed with great facility.

An eraser case has been patented by Mr. Louis Krob, of Zanesville, O. The case has two slides, on one of which is an eraser, and the other has an abrading surface for cleaning the eraser; when used the slide is withdrawn from the casing, and is reversed and passed back, so the casing serves as a handle for the eraser.

A screen frame has been patented by Mr. George Phillips, of Tilford, Ill. The end bars of the frame have longitudinal grooves in the side surfaces, combined with which are side bars, with hook plates or clips on the ends, the hooks passing into the grooves in the end bars, the whole making a frame which can be readily adjusted in height and width.

A deodorizing and antiseptic water closet cover has been patented by Mr. Frederick H. Hubbard, of Brooklyn, N. Y. The cover is made in box form, with a non-corrosive interior vessel having fine perforations, so the liquid contents of the interior vessel will be allowed to drip when the cover is closed, and will not drip when the cover is open.

A tile machine has been patented by Mr. Warner Lewis, of Stone Bluffs, Ind. The invention covers a special construction and arrangement of cylinders, case, die plates, and core, alike applicable for the use of plungers or pistons instead of augers for forcing out the clay, and such provision is made that the union of two streams of clay on the sides of the forming core is greatly facilitated.

A picture case for tombstones has been patented by Messrs. Harvey A. Holloman and William R. Green, of Kingston, Texas. The invention relates to the general construction of the case, and the method of securing it in the tombstone, the outer surface of the case standing flush with the outer surface of the stone, and so the case cannot be removed without breaking the stone.

An improved gate has been patented by Mr. Mark W. Foster, of Minneapolis, Minn. It is so contrived that a carriage wheel, coming in contact with the end of a horizontally swinging lever, and pushing it along the ground, is made to raise and swing the gate on a lever, or cause it to roll back along a track, the gate being suspended at the middle from the said lever or track.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Engineer experienced in introducing machinery abroad wishes to represent American manufacturer in Europe. 3041 Dauphin, Philadelphia, Pa.

Renshaw's Ratchet Drills. No. 1, $10; No. 3, $15. Cash with order. Pratt & Whitney Co., Hartford, Conn.

All Scientific Books cheap. School Electricity, N. Y.

If you want the best cushioned Helve Hammer in the world, send to Bradley & Company, Syracuse, N. Y.

Steam Gauge making—vacuum, low pressure, and hydraulic; repairing all kinds of makers' gauges. P. O. Box 50, Paterson, N. J.

60 Lathes, new and second-hand, 12" and 14" swing, plain and screw cutting. J. Birkenhead, Mansfield, Mass.

Mills, Engines, and Boilers for all purposes and of every description. Send for circulars. Newell Universal Mill Co., 10 Barclay Street, N. Y.

Wanted.—Patented articles or machinery to manufacture and introduce. Lexington Mfg. Co., Lexington, Ky.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 45 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Cyclone Steam Flue Cleaner. The best in the world. Crescent Mfg. Co., Cleveland, O.

For Freight and Passenger Elevators send to L. S. Graves & Son, Rochester, N.Y., or 46 Cortlandt St., N. Y.

Sewing machine, water closet, & other light castings made to order. Lehigh Stove & Mfg. Co., Lehighton, Pa.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 86 John St., New York.

Stationary, Marine, Portable, and Locomotive Boilers a specialty. Lake Erie Boiler Works, Buffalo, N. Y.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

The Hyatt filters and methods guaranteed to render all kinds of turbid water pure and sparkling, at economical cost. The Newark Filtering Co., Newark, N. J.

"The Sweetland Chuck." See ad. p. 316.

Steam Boilers, Rotary Bleachers, Wrought Iron Turn Tables, Plate Iron Work. Tippett & Wood, Easton, Pa.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Pumps—Hand & Power, Boiler Pumps. The Goulds Mfg. Co., Seneca Falls, N. Y., & 15 Park Place, New York.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent agency, 361 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Curtis Pressure Regulator and Steam Trap. See p. 286.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 286.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 286.

Drop Forgings. Billings & Spencer Co., Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box . Pottsville, Pa. See p. 301.

Stephen's Vises. Special size for amateurs. See p. 301.

Brass & Copper in sheets, wire & blanks. See ad. p. 318.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 318.

Munson's Improved Portable Mills, Utica, N. Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) R. P. C. asks if there is any process by which iron and glass plates may be firmly welded together, that is, the two flat surfaces; for example: could a glass surface or plate be placed upon a plow shovel, or laid upon any iron surface in that manner? A. Plow shares or any iron surfaces can be faced with glass or enamel by pulverizing the material and mixing with water and a little clay or borax to make it adhere. Then heat in a furnace until the glass is melted and adheres to the iron. A thin coat would stick. Plates of glass could be warped to the shape of the plow share and melted upon it. The difference in contraction between the iron and the glass upon cooling would crack the glass off from the iron and destroy its value. We cannot see any advantage of glass over hardened steel, considering its brittle nature.

(2) W. S. B.—We can add little to what you are doing, except to arrange your stuff to bend as hot as possible. A jet of steam upon the piece while bending will help, where you are taxing the bending qualities of the wood to its utmost.

(3) F. P. asks: Would it require more power to run an engine placed 400 feet from the boiler, than one within 10 feet? A. The loss by placing the engine 400 feet from the boiler, would be that of condensation in the steam pipe, which would depend upon the protection of the pipe. The power of the engine in either case would be the same if the pressure maintained at the engine is the same.

(4) C. A. P.—We suggest you exhaust into a surface condenser immersed in the water of the pump with a non-return valve. This will cause a back pressure on the steam piston, which will require a little higher pressure of steam to do the work; or if you add an air pump to take off the water of condensation, it will require a less pressure of steam.

(5) J. D. B. writes: I have a small engine and boiler. Cylinder has 2 inches bore, 3 inches stroke. Is it strong enough to drive a boat 18 feet long, about 3 feet 6 inches wide at its widest place. Has side wheels with five paddles in each; boiler pressure, 60 pounds. A. No; your engine would be useless to drive side wheels. It could be applied to a screw propeller to better advantage if you have sufficient boiler; but even then the speed of the boat would be slow.

(6) L. P. B. asks how to get the essence of Portugal, or how to manufacture it. Also the essence of canella. A. The scarcely ripe fruit of the sweet variety of orange is made to yield an oil from the rind by means of the "sponge" process, which is the same as used in extracting the oil from lemon, and is practically nothing but expression. The varieties of apparatus used differ somewhat in various places. An essential oil erroneously called "white cinnamon" is obtained by the aqueous distillation of the bark of canella alba. These articles may be procured through any wholesale druggist. Information regarding the details of the processes may be obtained by consulting Spons' Encyclopædia of the Industrial Arts, or else either Piesse's or Christiani's works on perfumery.

(7) M. E. B. H. writes: 1 In a bale of my stove pipe iron, I find from three to five sheets nicely polished on one side while the rest of it is rough; why are they there, and is it polished on purpose? A. There are several grades of stove pipe iron, and the inference is that some of the better quality has become mixed in (possibly to make up the proper amount) with that of an inferior quality. 2. How is candy made with objects formed in the center in bright colors, such as flags or letters? A. The figure inside is first formed of suitable design and in appropriate colors, and the whole mass then covered with a transparent coating of some saccharine compound. 3. What is the process of brazing, and how is lead pipe formed? A. Brazing is synonymous with hard brazing, the alloy used generally consisting of equal parts of copper and zinc, and the flux used is borax. The manufacture of lead pipe is described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 416. 4. How is calico printed or stamped so as not to blur the different lines? A. By means of stencil plates. 5. What process do tinners use to remove finger marks from tinware and give it a bright, clean look after finishing? A. By immersion in acid.

(8) F. W. C. writes: I want a formula for making and using the composition which is used to take a mould from an undercut object say in plaster, which will be insoluble in an electrotype solution of sulphate of copper. A. We believe the following is about what you want: 12 pounds of glue are steeped for several hours in as much water as will moisten it thoroughly; this is put into a metallic vessel, which is placed in hot bath of boiling water. When the glue falls into a fluid state, 3 pounds of molasses are added, and the whole is well mixed by stirring. The article to be moulded is now placed in a cylindrical vessel sufficiently deep, so that it is an inch or so higher than the object. The inside of this vessel is then oiled, and a piece of stout paper is pasted in the bottom of the object to prevent the fluid from going inside, and if it is composed of plaster, sand is put inside to prevent it from floating. It is next completely drenched in oil and placed upright in the vessel. This done, the melted mixture of glue and molasses is poured in till the article is submerged to the depth of an inch. The whole must stand for at least twenty-four hours till it is perfectly cool throughout. The original is then removed. A mixture of wax and resin with occasionally a little suet is melted and allowed to stand till it is on the point of settling, when it is poured into the mould and left to cool. In order to prevent its dissolving in the battery mixture the copper must be dispersed very rapidly at first, and thus it becomes protected from the action of the solution.

(9) W. H. P. writes: Quite a controversy has arisen on the placing of two 60 inch return tubular boilers. They are to be placed side by side divided by a wall, thus making separate furnaces under each, etc. The blow off pipes are separate, no mud drum being used. They are connected on top from 36 inch by 36 inch domes, by 5½ inch pipe leading to a T near center, thence through one pipe to engine. Is there any danger of these boilers robbing each other of water? And if so, will you kindly give me the best and most effective remedy for the same? Will all boilers, large or small, or both, be affected in same way when similarly placed? A. In setting gang boilers the only precaution necessary to prevent unequal water level by unequal firing is to make all water connections separate for each boiler. No two boilers should be connected with one mud drum. The old style of connecting gang boilers with a common mud drum and a common steam drum was considered good practice when the steam connections were very large between the boilers and the steam drum, with the steam pipe taken from the drum, so that the pressure in each boiler was equalized. 2. Will a 3 inch pipe leading from top of shell of one boiler into top of shell of the other have any effect? And if so, what? Would they not rob as quickly through this with unequal fire, if not more so, as without it? A. A 3 inch direct connection between steam spaces of each boiler independent of the steam outlet might equalize the water level, but we do not approve of the practice that requires any such contrivance. Make the feed pipe to each boiler from the main feed pipe to contain a valve and a check valve, and use this valve to regulate the feed of the boilers. It is not always necessary to feed one at a time; you may feed half a dozen, shutting down the valves on those that are feeding too fast. Also keep the blow off for each boiler separated by a cock between the boiler and the main blow off pipe. It is good practice to put a valve upon each side side of the check valve, for obvious reasons.

(10) S. C. M. writes: 1. I want a receipt for coloring wood purple and black, for small rollers. A. Pour 2 quarts boiling water over 1 ounce powdered extract of logwood. Brush the wood several times with this decoction, and when dry give a coat of pearl ash solution 1 drachm to a quart; lay it on evenly, and the result will be a purple color. For black: wash with a concentrated aqueous solution of extract of logwood several times; then with a solution of acetate of iron of 14° Baume, which is repeated until a deep black is produced. 2. I also want a process by which hard maple can be filled with something harder than itself, that will make it wear well. A. Try a filling composed of equal parts by weight of whiting, plaster of Paris, pumice stone, and litharge, to which may be added a little French yellow asphaltum, Vandyke brown, and terra di Sienna. Mix with 1 part japan, 2 of boiled oil, and 4 of turpentine. Grind fine in a mill.

© 1884 SCIENTIFIC AMERICAN, INC

Lay the filling on with a brush, rub it in well, let it set 20 minutes, then rub off clean. Let it harden some time, rub smooth, and if required repeat the process. When the filling is all right, finish with linseed oil, applying with a brush, wipe off, and rub to a polish with fine cotton, and finish with any fine fabric. 3. Also a process for giving wood rollers a high polish, quickly, while in the lathe. A. Dissolve sandarac 1 ounce in spirit of wine ½ pint; next shave beeswax 1 ounce and dissolve it in sufficient quantity of spirits of turpentine to make it into a paste; add the former mixture by degrees to it, then with a woolen cloth apply it to the work while it is in motion in the lathe, and with a soft linen rag polish it. It will appear as if highly varnished.

(11) J. C. R. writes: 1. I am building a steam launch 40 feet long by 12 feet beam; what description of boiler for strength, durability, and economy, and would take up the least room, is the most advisable for me to put into her, and what may it cost? A. A horizontal cylindrical boiler with cylindrical furnace, two return tubes above and alongside of the furnace. 2. What is the best description of engine and propeller (say two or four blades) to give her say a speed of 12 knots per hour, and correspond with the boiler in all particulars, as well as taking up the least room, also its cost? A. The ordinary vertical inverted engine, noncondensing, if economy of fuel is not much object; if it is, then use a surface condensing engine, either simple or compound. A twin screw, three blades, will be best. You must have ample power and a good, easy model to get 12 knots per hour. Price of engine and appurtenances, about $850. Of engine and boiler, propeller and shaft, with all appurtenances and connections, about $1,800.

(12) O. H. McK. asks: 1. How can I polish small Norway iron hooks about 1 inch in length? A. You can polish small hooks by tumbling in a keg revolving upon a shaft. Use sharp sand mixed with the hooks, and finish with saw dust. 2. I have several thousand very soft cast iron tubes about 8 inches in length, ¾ inch hole, and closed at one end; they have grease in them, and I want to know how to get them perfectly clean. Can you tell me of some wash or other means to clean them without rusting them? Would a wash of sal soda and water rust them? A. Boil the pieces in water with a little soda and lime, say one ounce of each to a pail of water. Take the work from the water boiling hot, and dry immediately by placing upon a hot plate or in a warm place. 3. How can I caseharden small Norway iron rivets about ¾ inch long and ⅛ inch diameter? A. Caseharden the rivets by packing in an iron box (sheet iron will do) with charcoal and powdered prussiate of potash, or bone charcoal or scraps of leather cut fine. Heat for an hour at a full red, and pour out rivets and dust into a tub of water. You cannot wait to separate the rivets from the packing. They will cool too fast, and interfere with the hardening.

(13) S. J. W. writes: I see by your issue of March 21, my question (51) was not satisfactory in regard to power of screw. The lever will be 12 inches; power applied at end of lever, 75 pounds; screw one-eighth pitch, point tapered to angle of 30 degrees working between two pins to suit angle of screw point. What pressure would they exert in separating any amount of weight, in other words, what weight will they lift? I think the power is equivalent to a screw 32 to the inch in the way it is applied, if the rule holds good in all cases. Am I right? With a traveler of 75 inches for lever, the pins only move one thirty-second. The rule I believe is, as pitch of screw to circumference, so is power applied to weight raised. A. Your rule is right. Multiply weight or pressure applied to the end of the levers by the distance traveled in one revolution of the lever, and divide by the pitch of the screw, distances and pitch of screw to be in inches or fraction of an inch; but this will give the theoretical result. A very large deduction must be made for friction, say 35 to 40 per cent.

(14) E. S. B. asks: If by electrical action I deposit all the lead from a solution of the plumbate of potash, will the remaining potash solution still retain the power of disintegrating, and through use of a continued current of electricity again deposit the new lead ingredient added to constitute the plumbate of potash? A. The potash is not affected under the circumstances; potassium hydroxide is formed.

(15) J. W. P. asks the formula usually used in America for calculating the power of stationary and marine boilers, and also the safe working pressure of the same, for iron and steel plates. A. There is no generally received rule. From 12 to 16 feet of heating surface is usually allowed per horse power. The smaller surface to the plainest, simplest, and well proportioned boiler. The only accepted standard is 30 pounds of water evaporated per horse power per hour.

(16) P. F. Manufacturing Co. asks the best process to japan wire. A. Japan wire by drawing it through the varnish, holding it in the varnish by passing the wire through a hole or slot in a piece of iron pushed under the surface of the varnish, also a scraper or brush to draw off excess of varnish or make the varnish thin enough to just cover the wire in quantity. Hang the wire in an oven heated to 250°, supposing the wire may be 1 foot or 10 feet long, as you give no detail of what you wish to do, or as to what is the shape of the wire.

(17) F. A. L. asks how he should construct a rain water cistern in gravelly soil. A. Build the cistern with hard burned bricks and Portland cement, backed with a grout of Portland cement and clean sand. Plaster the inside with a thin coat of clear Portland cement.

(18) C. K. asks the theory of the working of an inspirator, and why does it refuse to work in very cold water; and have you a receipt for marking bags and bales? A. Inspirators work by the transfer of the high velocity of the steam to its equivalent weight in water by its instantaneous condensation in contact with water. The water inducing the condensation partaking of the velocity of the steam re-enters the boiler not only against its own pressure, but will feed a boiler of much higher pressure. We do not know that it will not work in very cold water. It may require a different adjustment for extremes of temperature in the feed water. Lampblack and turpentine is generally used for marking bales and boxes.

(19) J. McF. writes: 1. In SUPPLEMENT, No. 247, you give bacteria process of vinegar making; I want to know how many and what size of air holes are sufficient for 200 liter vat. A. The air holes are for the purpose of promoting the acetification, which is the oxidation of the vinegar, and therefore we would recommend you to use quite a number, and preferably a large number of small ones, rather than fewer larger ones. 2. Will the mixture of alcohol, water, etc., acetify without mycoderma cetifirst being sown on the surface? If not, how or where can this be obtained for the first mixture? A. No. The mycoderma are obtained from fermented vinegar. 3. What is the vaporizing process of vinegar making, in which alcohol is vaporized in such a way as to produce a superior article of vinegar quickly? A. The vaporizing process consists in treating the alcohol with a standard liquor and allowing it to flow over shavings, while the air coming in contact with the vinegar hastens the operation. 4. What is water lac? A. We presume reference is made to the water lac varnish, which is a mixture of 5 ounces of pale shellac, borax 1 ounce, water 1 pint. Digest at nearly the boiling point until dissolved, then strain. 5. Is there any method of taking a positive picture which is entirely complete directly in the photo camera either on paper, glass, or other surface? If not, what is the quickest method of securing positive pictures? A. See Mr. J. B. Obernetter's paper on this subject in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 293.

(20) S. R. C. asks what he can use to clean wood type, where the black and colored inks have become hard and dry on the sides and face of the type. Benzine or turpentine has no effect on the hard dry ink. A. Wood type should be cleaned as soon as the forms come from the press. When the forms are allowed to stand a few days, it is very difficult to remove the ink. We sometimes use oil to soften the ink, and then remove it with benzine or turpentine.

(21) J. R. S. asks how to make pewter look like silver by a wash. A. The best thing to do in order to produce a brilliant surface would be to tin the spoons. This is accomplished by dipping, and the process is fully described under the head of Electro Metallurgy, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310. We think that you can silver the articles by mixing one part silver chloride with 3 parts pearl ash, 1½ parts common salt, and 1 part whiting. Rub this mixture on the surface of the metal by means of a piece of soft leather or cork, moistened with water and dipped into the powder. It is likewise possible to coat certain metals with nickel by first boiling the article in a solution of zinc chloride containing metallic zinc, and then adding a soluble nickel salt.

(22) J. D. asks: How can the length of wire used in a cable, having for data the number of the wire, the number of strands, and the number of twists per unit of measure of each, be obtained? A. For the length of a wire in a strand, add to a given length as many times the circumference of the strand as there are twists in the given length, for the outside wires; and proportionately for the inner row. The center wire is supposed to be straight. Proceed in the same way for the strands. The excess of wire in each strand added to the excess of the strands over the length of the cable will give the whole length of wire used.

(23) J. W. C.—The aurora has been made a special study by physicists and spectroscopists for several years. Its true solution has not yet been reached, owing to the variable and complex spectra caused by the interference of the atmosphere and its moisture. Its primary element, however, is supposed to be electricity. The floating cobwebs in the air are supposed to be an overproduct of the spinnerets of spiders, although there is room for observation as to their fungoid origin. The fine ashy dust may have a volcanic origin, and be connected with the phenomena of the red sunsets during the past season. It has been gathered in other places.

(24) W. G. B. asks: (1). What power engine should it require to raise one ton 40 feet high in one minute on ordinary platform elevator, making reasonable allowance for friction and power consumed in running winding machine? Weight of elevator platform is balanced by counter weight, all but about two hundred pounds. Winder is of the common worm gear type, run by belt from counter shaft, with 32 inch winding drum. A short counter shaft with two pulleys on it, one to receive belt direct from engine, the other to match winder pulleys, is all the gearing there is between engine and winder. A. For unbalanced weight of 2,440 pounds, 40 feet per minute, 3 horse power, making allowance for friction, etc., of the arrangement you describe; we advise to double this power, or say 6 horse power. 2. With the above rig, what weight should a four-horse power engine be expected to hoist 40 feet high in a minute and a quarter, what weight the same height in a minute and three-quarters, what weight in two minutes, making reasonable allowance as before for friction and power consumed in running the winding gear? A. An actual 4 horse power engine should raise, allowing as before one-half for friction, etc., 40 feet in 1¼ min. = 32 feet per minute, 2,091 pounds. For any other velocity the weight will be decreased as speed is increased; say 64 feet per minute (double velocity), the weight will be one-half = 1,046 pounds.

(25) F. J. F. writes: 1. In answering a correspondent a few weeks since, how to remove impurities from lead, you mention substances rich in oxygen. Now, in my business I use an alloy—stereotyper's metal—but it is too granular, too hard. Now, will the antimony, etc., liberated by the nitrates, etc., be in a condition to be recovered, so as to use again, should my metal get too soft? In what quantity must the nitrates, etc., be added? A. The process referred to is not suitable for alloys. The stereotype metal, having the composition of tin 1 part, antimony 1 part, lead 4 parts, is recommended by Spon. 2. Also, please inform me how to make a strong, quick drying glue size? A. For a quick drying size, we would recommend you to use a good glue and add alcohol to the preparation resulting from having dissolved small pieces of glue in water. Cork tight, and set aside for several days, and when completely in solution it will be found a most excellent article.

(26) F. A. L. asks for a work published on the manufacture of perfumes. A. A Comprehensive Treatise on Perfumery, with Thorough Practical Instructions, and Careful Formula, by R. S. Christiani, 8vo, 1878, price $5.00. Art of Perfumery and the Method of Obtaining the Odors of Plants; the Growth, and General Flower Farm System of Raising Fragrant Herbs, with Instructions for the Manufacture of Perfumes, Scented Powders, etc., 4th London edition, 8vo, 1875, cost $5.50. The above are the two most important publications on the subject.

(27) M. McI. asks how patent leather can be prevented from cracking, especially patent leather boots. A. To prevent patent leather from cracking, always heat the leather over the flame of a candle before inserting the foot in the shoe. Heat renders patent leather soft and pliable, so it is advisable to wear overshoes over patent leathers in very cold weather. There is also an excellent cream paste sold in London, and called Metropolitan varnish, which keeps patent leather in excellent condition. We believe it cannot be bought in this market, however.

(28) D. S. F. writes: There is a traveling man here purporting to nickel plate spoons, knives, forks, etc. He has a gasoline lamp, and above the lamp he has a cylindrical tube about 2½ inches diameter and about 10 inches deep; in this tube he has his dipping metal, which is kept fused by the heat of the gasoline lamp. He dips his article to be coated first in muriate of zinc, then in oil, and also in water. Will you tell me the metal or metals he uses in his tube, or what kind of metal or amalgams will answer in this way for coating the spoons, etc., or any other simple process without the use of a battery? A. We presume you refer to Stolba's process, which is as follows: Into the plating vessel—which may be of porcelain, but preferably of copper—is placed a concentrated solution of zinc chloride, which is then diluted with from one to two volumes of water, and heated to boiling. If any precipitate separates, it is to be redissolved by adding a few drops of hydrochloric acid. As much powdered zinc as can be taken on the point of a knife is thrown in, by which the vessel becomes covered internally with a coating of zinc. The nickel salt, either the chloride or the sulphate, is then added until the liquid is distinctly green; and the articles to be plated, previously thoroughly cleaned, are introduced, together with some zinc fragments. The boiling is continued for fifteen minutes, when the coating of nickel is completed, and the process is finished. The articles are well washed with water and cleaned with chalk.

(29) N. F. W. writes: I am going to make a steam tricycle, and would like to ask, through the means of your valuable paper, if an engine with two cylinders, 1 inch bore and 2 inches stroke, with from 80 to 100 pounds of steam and making 700 revolutions a minute, be sufficient to obtain a speed of from six to eight miles? A. Engine 1½ inches by 3 inches preferred. It has the most power, and will have less weight in proportion to power. 2. Would one cylinder 1½ inches bore and 3 inches stroke be better? A. On smooth level roads should make eight miles per hour if the power is properly applied. 3. What size boiler would I need, and how large the wheels? A. Boiler should have 30 to 35 feet heating surface.

(30) C. G. L. asks: 1. In the SCIENTIFIC AMERICAN of December 9, 1882, you gave a cut of a propeller boat. 1. Can such a boat be made to run ten miles an hour? A. Not by the power of one man. 2. Is it any harder work to run one than to row? A. Yes. 3. Can greater speed be obtained with a screw than an armed propeller, 1 foot in diameter, with four arms, screw 1 foot long? A. Yes.

(31) C. H. L. writes: 1. I have a self-feeding (of coal) steam boiler for heating, with a 30 inch circular grate. To obtain the benefit of the addition of a small supply of gas to the fuel, how shall I proceed? If I put a single jet close under the grate in the center, I fear only a small portion of coal will be benefited; and if I put in a dozen jets, economy will not be attained. A. We fear the jet could not be safely applied in your case. To get the benefit of the gas jet, the grate should be entirely free of ashes and clinkers, which is not the case with heating boilers, as they are generally run for many hours without clearing out ashes. 2. Should not the gas be mixed with air before it escapes from the burner? A. The jet will get its supply of air without any special provision. 3. If I should let the gas into the ash pit, about 6 inches below the grate, in a 30 inch ring, pierced with 4 holes, would not an explosion be the result? A. Any experiment should be made with great care; any collection of gas in the ash pit, occasioned by a "clogged" grate or insufficient draught, would be likely to lead to an explosion.

(32) J. M. M. asks how to make or mix the acid used to etch on steel plates for printing. Also, what is meant by nitric acid 15° B.? A. Iodine 1 ounce, iron filings ½ drachm, water 4 ounces. Digest till the iron is dissolved, or else, pyroligneous acid 4 parts by measure, alcohol 1 part. Mix, and add 1 part double nitric acid (sp. grav. 1·28). Apply it from 1½ to 15 minutes. Dilute nitric acid is frequently all that is used; 15° B. means 15° on the Baume scale of hydrometer.

(33) B. T. S. asks: What is "flexible sandstone"? Too hard to cut with a knife, yet pliable between finger and thumb, same as piece of rubber. A. The mineralogical name of the article is itacolumite; its composition is expressed in the term flexible sandstone. The quality of flexibility is due to the arrangement of the grains of sand.

(34) G. J. Van D. writes: 1. In the SCIENTIFIC AMERICAN, April 5, answer 43, you say: "Add about half an ounce of bisulphate of mercury to every 5 pounds of solution." What is the result accomplished by this addition? A. The mercury salt is added in order to keep the zincs thoroughly amalgamated. By its use a surplus of mercury is always provided for. 2. What is the best alloy to cast small figures, etc., for electrotyping, to make bronze ornaments? One that will run sharp in plastic moulds and melt at a low temperature, *i. e.*, over a gas stove? A. We would recommend the use of type metal as suitable for your purpose.

(35) C. C. B.—In order to prepare carmine, 1 pound of cochineal is boiled with 4 drachms of potassium carbonate in 7½ gallons of water for fifteen minutes. Remove from the fire, stir in 8 drachms powdered alum, and allow to settle for twenty to thirty minutes. Pour the liquid into another vessel, and mix in a strained solution of 4 drachms isinglass in 1 pint of water; when a skin has formed upon the surface, remove from the fire, stir rapidly, and allow to settle for one-half hour, when the deposited carmine is carefully collected, drained, and dried.

(36) P. J. N.—The following is a crimson stain that is frequently used for musical instruments: Ground Brazil wood 1 pound, water 3 quarts, cochineal ½ ounce; boil the Brazil wood with water for an hour, strain, add the cochineal, boil gently for half an hour, when it will be fit for use. This is first applied, and then the varnish, consisting of rectified spirits of wine, ½ gallon; add 6 ounces gum sandarac, 3 ounces gum mastic, and ½ pint turpentine varnish; put the above in a tin can by the stove, frequently shaking till well dissolved; strain, and keep for use. If you find it harder than you wish, thin with more turpentine varnish.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

D. W.—1. Pyrite, or iron sulphide. 2. Calcite, crystallized calcium carbonate. 3. Is a compact sandstone. There is no stillbite or chabazite among the specimens received.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

May 6, 1884,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Alarm. See Burglar alarm.
Alarm lock, R. G. Vassar ... 298,136
Annunciator, electric, P. Seiler ... 298,242
Asbestus compound and articles made therefrom, C. F. Brigham ... 298,281
Aspirator, surgical, C. B. Hardin ... 297,989
Axle box, car, J. W. Carr ... 298,171
Axle box, car, G. W. Stewart ... 298,320
Axle box, car, D. S. Stimson ... 298,253
Axle, vehicle, J. J. Devine ... 297,973
Bag. See Traveling bag.
Ball. See Base ball.
Barber's shears, guard for, E. Bateman ... 297,964
Base ball, T. P. Taylor ... 298,041
Basin, enameled iron wash, Cochran & Milligan ... 297,287
Battery. See Galvanic battery.
Bearing for shafts, spindles, etc., S. J. Howell ... 298,207
Bedstead, wardrobe, E. Nash ... 298,112
Beer cooling apparatus, H. E. Deckebach ... 298,071
Bell and annunciator, electric, J. D. Gilchrist ... 298,080
Bellows, J. S. Williams ... 298,261
Belt fastener, J. A. Roberts ... 298,120
Belt gearing for machinery, J. H. Cromie ... 298,291
Belt holder, machine, W. R. Santley ... 298,238
Berth, ship's, Milligan & Killion ... 298,012
Bicycle step, G. F. Harwood ... 297,991
Billiard cue and walking cane, combined, W. G. Morse ... 298,111
Blind, window, H. Brotherton ... 298,170
Blotting pad, E. A. Scribner ... 298,124
Book rack, J. Swartz ... 298,039
Books with wire staples, machine for stitching, E. Preusse ... 298,117
Boot and shoe heel blanks, machine for concaving, W. Y. Ober ... 298,113
Boot crimp, F. M. Bratton ... 298,167
Boot or shoe insole, T. Bolton ... 298,278
Bottle holder, E. R. Richards ... 298,233
Bottle stopper attachment, C. H. Bennett ... 298,273
Bottling and shipping can, combined, C. R. Peaslee ... 298,023
Bottling machine, J. C. Blair ... 298,060
Bracket. See Pulley bracket.
Brake shoe, C. F. Brigham ... 298,283
Breast and skirt supporter and shoulder brace, combined, M. Clarke ... 298,067
Brush, paint, J. F. Bowditch ... 298,166
Bung, A. G. Anderson ... 298,165
Burglar alarm, R. G. Vassar ... 298,137
Burner. See Gas burner.
Button, J. F. Atwood ... 298,154
Button, N. B. Hale ... 298,082
Button, collar, G. Krementz ... 298,303
Button fastener, R. Sanford ... 298,316
Button feeding apparatus, Hawkins & Woodward ... 298,201
Buttonhole, E. G. Harris ... 298,198
Button, separable, Robinson & Lallement ... 298,236
Button setting instrument, J. F. Atwood ... 298,155
Button setting machine, Hawkins & Woodward ... 298,200
Cables, gripping and crossing, R. Ramsden ... 298,312
Can. See Oil can. Paint can.
Can, W. Harris ... 297,990
Cane juice, apparatus for extracting, G. B. Boomer ... 298,165
Canister and mill, combined coffee, E. Norton ... 298,017
Car coupling, E. M. Bates ... 268,272
Car coupling, A. B. Fiske ... 298,191
Car coupling, J. P. Lancaster ... 298,214
Car coupling, F. F. Lutz ... 298,005
Car coupling, S. B. Mayfield ... 298,010
Car coupling, N. J. Skaggs ... 298,083
Car coupling, G. W. Sowles ... 298,319
Car coupling, L. & G. P. Stebbins ... 298,127
Car coupling, S. B. Zimmerman ... 298,264
Cars, detachable compartment for, E. S. Henry ... 298,086
Cars, safety bridge for railway, B. L. Ferris ... 298,075
Carburetor, L. C. Beebe ... 298,058
Card or ticket holder, H. Willson ... 298,048
Carpet stretcher, Dunnell & Smith ... 298,074
Carriage top, Buchholz & Morris ... 297,968
Carriage window frames to curtains, securing, A. S. Parker ... 298,021

© 1884 SCIENTIFIC AMERICAN, INC

Cart, road, C. H. Straight ... 298,254
Carving meat, holder for use in, Chevalier & Graillot ... 298,174
Cash transmitter, H. Gazaillie ... 298,077
Centrifugal separator, J. J. Hendrickson ... 297,994
Chain link blanks, machine for making, L. McGilvray ... 298,220
Chair. See Folding chair.
Check and draft, bank, J. K. Cleary ... 298,177
Check, baggage, C. C. Smith ... 298,034
Chuck, lathe, W. A. Montgomery ... 298,015
Churn dasher, S. M. Tilson ... 298,042
Clasp. See Garment clasp.
Clock and watch stop mechanism, P. G. Russell ... 298,313
Clock, secondary electric, Himmer & Weisgerber. 298,205
Clocks, circuit closer for electric, V. Himmer ... 298,301
Coal bucket, C. Cook ... 298,180
Cock, stop, J. H. Blessing ... 298,062
Cocoanut sheller, J. G. Webb ... 298,047
Collar, horse, C. A. Pettie ... 298,231
Collar, horse, C. Staufenbeil ... 298,126
Compasses, W. Stromberg ... 298,038
Condenser for steam and smoke, J. M. Carver ... 297,969
Conveyer apparatus, Blickensderfer & Smith, 298,274 to 298,276
Cooler. See Water cooler.
Copying and engraving machine, automatic electric, A. Schmid ... 298,030
Cotton gin gearing, C. C. Warren ... 298,324
Cotton press, J. D. O'Daniel ... 298,226
Counter seat, A. E. Francis ... 297,982
Coupling. See Car coupling. Hose coupling. Shaft coupling.
Cross-head, G. H. Corliss ... 298,068
Cuff holder, Stafford & Henderson ... 298,035
Dead centers and for converting motion, device for overcoming, I. L. Hawkins ... 298,199
Deodorizing and antiseptic water closet cover, F. H. Hubbard ... 298,091
Derrick, C. T. Day ... 298,184
Distilling petroleum, apparatus for, E. Kells ... 298,210
Ditching machine, M. Milner ... 298,223
Dividers, R. Folger ... 297,979
Drawers, J. M. Cox ... 298,181
Drawers, J. C. Tracey ... 298,322
Drill. See Grain drill.
Drill and countersink, combined, A. J. Smart ... 298,248
Easel, T. C. Vail ... 298,257
Egg case, folding, W. G. Ruge ... 298,237
Electric circuit closing device, automatic, C. T. Ross ... 298,121
Electric circuit connector, E. Weston ... 298,326
Electric motor, L. W. Stockwell ... 298,130
Electric wires, laying underground, J. H. Page ... 298,020
Electrical circuit treaker, E. Weston ... 298,144
Elevator, W. J. M. Dobson ... 298,187
Elevator, C. A. Youngman ... 298,331
Embroidery, M. H. Pulaski ... 298,025
Embroidery, velvet and plush, Bally & Hartmann 298,053
Engine. See Steam engine.
Engines, utilizing the exhaust of, D. Renshaw ... 298,119
Engraving machines, ring and watch case attachment for, A. E. Francis ... 297,981
Eraser case, L. Krob ... 298,096
Excelsior machine cutter knife, C. L. Knight ... 298,211
Feed water heater, C. H. Magoon ... 298,006
Feed water heater, T. Marshall ... 298,105
Fence, metallic, D. A. Roach ... 298,235
Fences, machine for manufacturing, G. H. Shellaberger ... 298,032
Fences, warning plate for wire, S. Forrester ... 298,193
Fencing, etc., twister and spooler for the manufacture of wire, O. P. Briggs ... 298,280
Fertilizer distributer, B. F. Archer ... 298,270
Fertilizer pulverizer and distributor, C. F. Dinkle 298,186
Filing-papers, device for, J. C. Lang ... 297,999
Fire and water proof material for roofing, etc., C. F. Brigham ... 298,282
Firearm sight, W. Lyman ... 298,305
Fire escape, C. B. Anderson ... 298,266
Fire escape, C. R. S. Curtis ... 298,292
Fire escape and water conductor, V. W. Blanchard ... 298,163
Flanging machine, T. R. Morgan, Sr ... 298,224
Floor and ceiling for buildings, fireproof, J. O'Friel ... 298,227
Flour, manufacturing, J. B. Wheatley ... 298,259
Flooring, D. Ham ... 298,300
Flue cap, ventilating, H. L. Day ... 297,972
Folding chair, L. Bush, Jr ... 298,065
Font and poor box, combined holy water, J. J. Brennan ... 297,966
Forging machine, R. H. Beach ... 298,055
Fork, G. Pickhardt ... 298,232
Frame. See Screen frame.
Furnace. See Locomotive furnace. Regenerative furnace. Steel melting furnace.
Furnace grate, Jewell & Mathisen ... 298,093
Galvanic battery, C. L. Clarke ... 298,175
Game, R. B. B. Foote ... 298,192
Gangway for ships, T. I. Knight ... 298,212
Garment clasp, C. C. Shelby ... 298,031
Gas, apparatus for manufacturing illuminating, A. O. Granger ... 297,988
Gas burner, A. B. Lipsey ... 298,215
Gas burner, cut-off, A. C. Austin ... 298,052
Gas generator, L. C. Beebe ... 298,057
Gate, M. W. Foster ... 298,076
Gate, A. D. Mack ... 298,103
Gate, A. H. Staring ... 298,037
Generator. See Gas generator.
Glass articles, ornamenting, A. Weyer ... 298,145
Glass, flatting and annealing oven for, T. A. Zellers ... 298,332
Glove fastening, W. F. Foster ... 297,980
Grain drill, J. L. Ashurst ... 297,961
Grain separator, Huber & Strobel ... 298,302
Grindstone shaft, A. F. Weaver ... 298,046
Guard. See Saw guard.
Halter, E. Barnard ... 297,963
Halter strap fastening, J. Gibbons ... 297,983
Harness pad, T. A. Simmons ... 298,246
Harness, swiveling loop iron iron for, Mackay & Dunn ... 298,104
Harrow, rotary, D. Manuel ... 298,008
Harvesting machine, grain, Barnhard & Thomas. 298,054
Hat roll pressing machine, Gilman & Weiker ... 297,984
Hay stacker, W. Louden ... 298,218
Heater. See Feed water heater.
Hoe, wheel, S. Fuller ... 298,296
Holdback hook, C. L. Crowell ... 298,070
Holder. See Bottle holder. Lamp holder. Paper holder. Pen holder. Robe holder.
Hook. See Holdback hook.
Hoop splitting machine, I. Walborn ... 298,044
Hose coupling, A. Zoller ... 298,150
Hose, fire, G. A. Stuck ... 298,321
Hub, vehicle, J. Monk ... 298,014
Hydraulic jack, R. H. Dudgeon ... 297,975
Hydraulic motor, R. Leuchsenring ... 298,102
Ice plow, J. H. Knowles ... 298,213
Indicator. See Station indicator.
Injector and ejector, J. Wotapek ... 298,329
Insulating material, D. H. Dorsett ... 298,072
Jack. See Hydraulic jack. Lifting jack. Suspension jack.
Jewelry ring, I. F. Lee ... 298,100
Joiner, universal, A. Bean ... 298,056
Joiner's clamp, F. Restorff ... 298,027
Jug, sheet metal, R. Shaw ... 298,244
Keel block, adjustable, Lang & Tietjen ... 298,098
Ladder, Milligan & Killion ... 298,013
Lamp fixture, incandescent, E. Weston ... 298,327
Lamp holder, incandescent, E. Weston ... 298,142
Lamp, incandescent, E. Weston ... 298,325
Lamp socket, incandescent, E. Weston ... 298,143
Lamps, testing carbon conductors for incandescent, E. Weston ... 298,141
Lathe rest, S. H. Brown ... 297,967
Lawn tennis implements, case for, G. E. Shepard. 298,125
Lever press, differential, A. Duchscher *et al* ... 298,188
Lifting jack, T. Maxon ... 298,306, 298,307
Lock. See Alarm lock.
Looking device for closets, boxes, etc., E. T. Owen ... 298,114
Locking nut, G. W. Sampson (r) ... 10,476
Locomotive frame forging die, T. Morris ... 298,109
Locomotive furnace, B. Sloper ... 298,247
Locomotive wheel, J. H. Mann ... 298,007
Lubricator, G. McNeil ... 298,011
Mail bag catcher, W. H. Lockwood ... 298,216
Mash, etc., apparatus for cooling, T. Hayes ... 298,202
Mash tuns, false bottom for, G. G. Cave ... 298,172
Medical compounds, preparing, H. C. Lawrence ... 298,000
Metals in ammoniacal solutions, dissolving, C. R. A. Wright ... 298,149
Meter. See Rotary meter.
Mill. See Roller mill. Saw mill.
Miter box, J. Cashin ... 297,970
Mould. See Tile mould.
Mould board, O. A. Essig ... 298,189
Motion, device for converting, C. Bernhard ... 298,160
Motor. See Electric motor. Hydraulic motor. Spring and weight motor.
Mowing machine, E. Smith ... 298,249
Musical instrument, mechanical, G. H. Chinnock. 298,066
Neckwear tip, W. Fichtenberg ... 298,190
Nippers, police chain, E. D. Bean ... 298,158
Oil can, R. English ... 297,977
Overshoe, E. A. Saunders ... 298,239
Pad. See Blotting pad. Harness pad.
Paint can, E. Norton ... 298,018
Paint distributer, L. Walkup ... 298,138
Paper bag, soft tie, J. Arkell ... 298,152
Paper bags, making soft tie, J. Arkell ... 298,153
Paper holder, ornamental and fly, V. G. Tansey ... 298,134
Paper stock sorting and cleaning machine, R. O. & W. Moorhouse ... 298,108
Pen holder, S. A. Holman ... 298,090
Pen, stylographic fountain, Haring & Court ... 298,084
Pianos, device for cutting damper felt for, J. Swenson ... 298,040
Pill forming machine, A. H. Wirz ... 298,148
Pills, tablets, etc., machine for making, Wirz & Rausch ... 298,328
Pipe, curved, J. F. Bennett ... 298,059
Pipe wrench, J. Doyle ... 298,294
Planing machines, tool oscillating device for, J. Angus ... 298,269
Planter, check row corn, Weber & Friedman ... 298,139
Planter check rower, corn, C. S. Locke ... 298,003
Plow, G. P. Bascom ... 298,157
Plow, P. H. Starke (r) ... 10,477
Potato digger, S. D. Brown ... 298,064
Potato digger, F. A. Paul ... 298,022
Powder flask charger, H. T. Hazard ... 298,085
Power. See Tread power.
Power, device for transmitting, J. A. Sherman ... 298,317
Press. See Cotton press. Lever press. Seal press.
Printing machine inking mechanism, G. A. Wilson ... 298,147
Printing machine, lithographic, E. Jaeck ... 298,092
Printing machine, web, L. C. Crowell ... 298,182
Printing press feed guide, J. Blocher ... 298,164
Propelling apparatus for vessels, A. C. De los Rios ... 298,234
Propelling canal boats, G. R. Taylor ... 298,135
Puddling furnaces, cooling shield for, E. W. Hickman ... 298,203
Pulley bracket and block, Schneider & Pfanne ... 298,241
Pump, J. G. Irving ... 298,208
Pump fixture, chain, A. S. Wright ... 298,330
Pump, steam, G. McFeely (r) ... 10,475
Rack. See Book rack.
Railway rail, T. Breen ... 297,965
Railway signaling apparatus, C. H. Jackson ... 298,209
Railway switch signal, Alexander & Wheelhouse. 298,151
Rake, W. Barry ... 298,156
Ram, hydraulic, J. B. Yeagley ... 298,262, 298,263
Refrigerating car and chamber, E. Hamilton ... 298,083
Refrigerative furnace, J. W. Galvin ... 298,297
Rheostat, J. Doyle ... 298,073
Ring. See Jewelry ring.
Rock drills, pipe casing for submarine, C. A. Sterling ... 298,251
Robe holder for vehicles, G. H. Chappell ... 298,173
Roller mill, N. W. Holt ... 298,206
Rotary meter, J. A. Peer ... 298,230
Rubber fabrics, joining, I. B. Kleinert ... 298,095
Sash cord fastener, S. H. Russell ... 298,122
Sash fastener, R. McCabe ... 298,106
Saw, H. W. Peace ... 298,115
Saw guide, W. H. Dalby ... 298,293
Saw mill, circular, W. J. F. Liddell (r) ... 10,474
Saw mill feed mechanism, E. T. Gardner ... 298,195
Scale, E. R. Puffer ... 298,118
Scraper, road, L. Lamborn ... 298,097
Screen. See Window screen.
Screen frame, G. Phillips ... 298,116
Seal, E. J. Brooks ... 298,168
Seal press, E. J. Brooks ... 298,284
Seaming plush back fabrics, L. S. Cox ... 298,288
Separator. See Centrifugal separator. Grain separator.
Separator for peas, etc., R. D. Gladney ... 298,299
Sewer trap, T. Watkins ... 298,045
Sewing machine, buttonhole, J. H. Palmer ... 298,228
Sewing machine, cabinet, J. Bolton ... 298,277
Sewing machine, carpet, A. B. Smith ... 298,318
Sewing machine for brace wiring hats, M. H. Ryder ... 298,314
Sewing machine ruffling and gathering attachment, L. Onderdonk ... 298,309
Sewing machine tension, M. H. Ryder ... 298,315
Sewing machine tension mechanism, Diamond & Dial ... 298,185
Sewing machine treadle and stand, F. M. Weaver 298,258
Shade fixture, G. W. Steele ... 298,128
Shade roller catch, A. A. Lothrop ... 298,004
Shaft coupling, W. C. Crandell, Jr ... 298,069
Shaft coupling, T. E. & J. P. Golden ... 297,985
Shaping machines, tool oscillating device for, J. Angus ... 298,268
Sheaf gathering and shocking machine, S. C. Minear ... 298,107
Sheet metal vessels, handle attachment for, Krippendorff & Marsh ... 298,304
Sheller. See Cocoanut sheller.
Shelling and grinding machine, Wilcox & Botsford ... 298,260
Shelving, adjustable, H. F. Stocking ... 298,129
Ship's hull and propeller, Z. Oram ... 298,019
Shirt, S. Conde ... 298,178
Shoe uppers, gauge for goring, W. B. Kinsley ... 297,998
Show case, T. F. Curley ... 298,183
Sickle grinder, C. W. Claybourne ... 298,176
Signal. See Railway switch signal.
Skate, roller, C. F. Morse ... 298,110
Skate, roller, W. C. Vanneman ... 298,323
Slate, school, W. D. Heyer ... 297,996
Slotting machines, tool oscillating device for, J. Angus ... 298,267
Soda, obtaining, J. Townsend ... 298,256
Soda water apparatus, A. Bertelli ... 298,161
Soldering machine, Hausheer & Meyenberg ... 297,993
Spark arrester, J. S. Park ... 298,229
Spinning frame spindle bolster, A. Aldrich ... 297,959
Spoon, J. Bergfels ... 298,159
Spring. See Vehicle spring.
Spring and weight motor, A. Lewis ... 298,001
Station indicator, H. E. Bissell ... 298,162
Steam apparatus, rotating joint mechanism for, E. Wright ... 298,049
Steam engine, W. Golding ... 298,081
Steam generating apparatus, W. A. Pentecost ... 298,024
Steel melting furnace, open hearth, C. M. Ryder. 298,028
Stone and marble, manufacture of artificial, H. A. Daniels ... 297,971
Stone dressing machine, N. J. Swayze ... 298,132
Stone, manufacturing artificial, Randle & Turner 298,026
Store service apparatus, automatic, J. H. Goodfellow ... 297,987
Sugar and sugar masses, method of and apparatus for mashing, A. Fesca ... 297,978
Sugar, etc., device for loosening, J. S. Lash ... 298,099
Suspender end, Marcus & Anisz ... 298,009
Suspension jack for removing journal boxes of cars, J. M. Garverick ... 298,298
Switch operating mechanism, J. D. Stanwood ... 298,036
Tap wrench, N. Sawyer ... 298,029
Telephone exchange, mechanical, G. F. Shaver ... 298,243
Telephonic transmitter, H. Clay ... 298,286
Thrashing machine straw stacker, D. D. & P. J. Sprague ... 298,250
Thrashing machines, clover hulling attachment for, A. L. Gates ... 298,196
Tile machine, W. Lewis ... 298,002
Tile mould, drain, C. B. Hewitt ... 297,995
Tin cans, utilizing, B. F. Mechling ... 298,221
Tobacco caddy, sheet metal, E. H. Striker ... 298,255
Tobacco transporting rack, W. Sternberg ... 298,252
Tombstone picture case, Holloman & Green ... 298,089
Toothpick device, J. Hoffman ... 298,087
Toy, J. A. Crandall ... 298,289
Toy, alphabetical, J. A. Crandall ... 298,290
Track cleaner, car, Holden & Coe ... 298,088
Trrch clearer, W. Dunbar ... 298,295
Traction engines, steering gear for, A. P. Broomell ... 298,169
Trap. See Sewer trap.
Traveling bag, C. A. Zinkand ... 298,050
Tread power, E. Kilbourn ... 298,094
Trunk, E. Wilson ... 298,146
Trunk or box fastener, E. W. Brettell ... 298,279
Umbrella tip cup, J. Matzenbacher ... 298,219
Valve, J. M. Goldsmith ... 297,986
Valve, balanced rotary, J. L. Bogert ... 298,063
Valve, combined check and stop, J. H. Blessing ... 298,061
Valve gear, steam engine, O. F. Howard ... 297,997
Valve, puppet, H. F. Frisbie ... 298,194
Vehicle, side bar, H. W. Moore ... 298,016
Vehicle, side bar, C. W. Saladee ... 299,123
Vehicle spring, J. D. Dorsey ... 297,974
Velocipede, W. A. Lorenz ... 297,217
Velocipede treadle, P. Gendron ... 298,079
Vessel for containing aerated liquids, J. P. Haskins ... 297,992
Vessels, attachment of lips and spouts to, Milligan & Mouhot ... 298,222
Vessels, attachment of lips and spouts to, Mouhot & Milligan ... 298,308
Vise, bench, W. H. Northall ... 298,225
Vise jaws, die for making, J. Cain ... 298,235
Wagon running gear, P. Gendron ... 298,078
Wagon, spring board, H. L. Sherwood ... 298,245
Watch case, Harman & Skidmore ... 298,197
Watch case center, J. C. Dueber ... 297,976
Water closet, C. F. Pike ... 298,310
Water cooler, J. E. Welling ... 298,140
Water, purification of, A. R. Leeds ... 298,101
Wheel. See Locomotive wheel.
Whiffletree, E. R. Annable ... 297,960
Whip, S. Baker ... 297,962
Window screen, J. K. Proctor ... 298,311
Wire barbing machine, P. P. Hill ... 298,204
Wire barbing machine, D. C. Stover ... 298,131
Wire cloth, labeled, C. Swinscoe ... 298,133
Wire coating preparatory to drawing, B. F. Aiken, Jr., *et al* ... 298,051
Wire cutting machine, W. H. Savage ... 298,240
Wire wrapping or covering machine, C. Conner ... 298,179
Wrench. See Pipe wrench. Tap wrench.
Wrench, N. W. Vandegrift ... 298,043

DESIGNS.

Burial casket, I. G. Hatcher ... 14,987
Card, back of game, L. L. Smith ... 14,991
Card, Christmas, R. Sneider ... 14,992
Coffin tablet, O. McCarthy ... 14,989
Cultivator knife, I. A. Packard ... 14,990
Envelope, R. Sneider ... 14,993
Moulding, I. G. Hatcher ... 14,988
Stationery case, J. F. Tannatt ... 14,994

TRADE MARKS.

Bats, Indian clubs, etc., base ball, A. J. Reach & Co ... 11,159
Bats, Indian clubs, etc., base ball, A. G. Spalding & Bros ... 11,160
Copies of writings, drawings, and other delineations, apparatus for producing facsimile, W. F. B. Massey-Mainwaring ... 11,157
Dyes, W. M. Townley ... 11,161
Felts used for hammers and action parts in pianos and organs, A. Dolge ... 11,168
Medicine, certain proprietary, A. C. Meyer ... 11,158
Spool cotton, Clark Thread Company ... 11,164 to 11,166
Steel bars and plates, Detroit Steel and Spring Works ... 11,154
Tobacco, all kinds of manufactured, F. W. Felgner & Son ... 11,167
Tobacco, smoking, J. G. Butler & Co ... 11,153
Tobacco, smoking and chewing, G. W. Gail & Ax, 11,155, 11,156
Tobacco, smoking and chewing, P. H. Mayo & Bro ... 11,169 to 11,174
Tobacco, snuff, cigars, cigarettes, and cheroots, plug, twist, and smoking and chewing, C. W. Van Alstine ... 11,162
Watch, Waterbury Watch Company ... 11,163

A printed copy of the specification and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 361 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the forse going list, at a cost of $40 each. For full instruction address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

GET THE BEST AND CHEAPEST.

J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted *supertor to all others in quality, finish, uniformity of temper,* and *general durability.* One *Perin Saw* outwears *three* ordinary saws.

NEW BOOKS.

Fahie, J. J.—History of the Electric Telegraph. 500 pages, with illustrations ... $3.00
Walmisley, A. T.—Iron Roofs. 50 drawings to a large scale. Small folio ... $21.00
Workshop Receipts.—Third series. Electrical and Metallurgical Subjects ... $2.00
Smith, F. J.—Work-measuring Machines, as applied to Dynamos and Motors ... 40 cents.
Ayrton and Perry.—Electro-measuring Instruments. Winding Electro Magnets. Voltaic Arc. Three pamphlets, each ... 20 cents.

Circulars and Catalogues free.

E. & F. N. SPON, 35 MURRAY ST., NEW YORK.

CHAUDIERE BRIDGE, OTTAWA.—Description of a seven-span railway bridge recently constructed over the Ottawa River, Canada, forming, from the dangers of the undertaking, one of the boldest conceptions that has as yet been carried out on any railway in existence. Total waterway 2,050 feet; total length of iron superstructure, 2,154 feet; total length of bridge from shore abutments, 3,400 feet; cost, $510,000. With three illustrations, giving perspective view of bridge, map of locality, and vertical section of river bed and shores. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **283.** Price 10 cents. To be had at this office and from all newsdealers.

METALLIC SHINGLES.

$5.50 per square | ANGLO-AMERICAN ROOFING CO., 22 Cliff Street, New York.

TRANSMISSION OF POWER TO A DISTance.—By Arthur Achard. A paper read before the Institution of Mechanical Engineers. Being a summary of the practical results obtained in the transmission of power to a distance by different modes. I. Transmission of Power by Wire Ropes, and the formulæ for calculation. II. Transmission by Compressed Air, with formulæ. III. Transmission by Pressure Water, with formulæ. IV. Transmission by Electricity. General results obtained by the several methods. This is one of the most valuable, practical, and comprehensive papers on the subject recently published. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **274** and **275.** Price 10 cents each. To be had at this office and from all newsdealers.

BUGGIES for the TRADE. Territory given. ENTERPRISE CARRIAGE CO., Cincinnati, O. Catalogue FREE.

Tongaline

Liquor Tongae Salicylatus
TRADE MARK

THE NEW REMEDY FOR
NEURALGIA, RHEUMATISM, GOUT, SCIATICA, NERVOUS HEAD-ACHES, ETC., ETC.

Tonga is a product of the Tonga or Friendly Islands, where it has long been used as a domestic remedy. **Tongaline** is a combination of Tonga with salicylates, and has the endorsement of the medical profession through all the leading medical journals.
It is taken internally to counteract cause of complaint, and not intended merely to allay symptoms.
It contains no opium in any form whatsoever, and leaves no unpleasant or injurious reactionary effects
Dr. Park Ritchie, of St. Paul, states:
"Am prescribing **Tongaline** *with satisfactory results. For the indefinite aches and pains of nervous patients it is superior to any other anodyne. For nervous headache it is almost a specific."*
Full directions on bottle. PRICE ONE DOLLAR.
For Sale by all Druggists.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

ROOFING

For buildings of every description. Durable, light, easily applied, and inexpensive. Send for sample.
N. Y. COAL TAR CHEMICAL CO., 10 Warren St., New York.

© 1884 SCIENTIFIC AMERICAN, INC

Valuable Books
FOR
PAINTERS AND VARNISHERS.

Arlot.—A Complete Guide for Coach Painters. From the French of M. Arlot, Coach Painter. By A. A. Fesquet. To which is added information respecting the materials, and the practice of Coach and Car Painting and Varnishing in the United States and Great Britain. 12mo. $1.25

Andres.—A Practical Treatise on the Fabrication of Volatile and Fat Varnishes, Lacquers, Siccatives, and Sealing Waxes. From the German of Andres, Winckler, and Andés. By Wm. T. Brannt. Illustrated. 12mo, ... $2.50

Callingham.—Sign Writing and Glass Embossing. A complete practical illustrated manual of art. 12mo, $1.50

Davidson.—A Practical Manual of House Painting, Graining, Marbling, and Sign Writing. Illustrated by 9 colored plates of Woods and Marbles, and numerous wood engavings. 12mo, ... $3.00

Painter, Gilder, and Varnisher's Companion, containing the Arts of Painting, Gilding, Varnishing, Glass Staining, Graining, Marbling, Sign Writing, Gilding on Glass, Coach Painting and Varnishing, Harmony and Contrast of Colors, etc. 12mo, ... $1.50

Riffault.—A Practical Treatise on the Manufacture of Colors for Painting. From the French of Riffault and others. By A. A. Fesquet, Chemist. 80 engravings. 8vo, 659 pages, ... $7.50

☞*The above or any of our Books sent by mail, free of Postage, at the publication prices, to any address in the world.*

☞Our new and enlarged catalogue of Practical and Scientific Books, 96 pages 8vo. and our other catalogues, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA, PA.

ELECTRICAL BOOKS.

Johnston's new 32 page copyright **Catalogue of Books on Electricity and Magnetism** and their Applications, giving **Titles, Contents, Descriptions, and Prices** of the principal works on **Telegraphy, Telephony, Electric Lighting, Electro-Metallurgy, etc**, mailed **free** to any address. Send for a copy. **Books on Electricity,** or any other subject, mailed, **postage prepaid,** to **any address in the world,** on receipt of the price.

W. J. JOHNSTON, Pub., 9 Murray St., N. Y.

WATER-GAS.—A PAPER EXPLAINING the chemical nature of water-gas, showing what are the uses to which it may be applied, and indicating the position that its manufacture now holds. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **393.** Price 10 cents. To be had at this office and from all newsdealers.

PHONOGRAPHY, OR PHONETIC SHORT-HAND Catalogue of works by Benn Pittman, with alphabet and illustrations for beginners sent on application. Address *Phonographic Institute,* Cincinnati, Ohio.

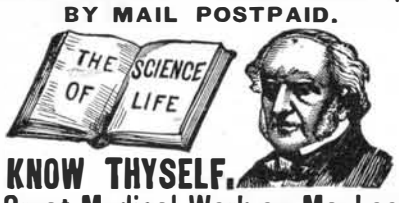
DYKE'S BEARD ELIXIR Forces luxuriant Mustache, Whiskers, or hair on bald heads in 20 to 30 days. No injury. Easily used. Beats the world. 2 or 3 Pkgs does the work. Will prove it, or forfeit $100.00. Price per Package with directions sealed and postpaid 25 cents, 3 for 50 cts., stamps or silver. L. A. L. SMITH & CO., Agents, Palatine, Ill.

OPIUM Morphine Habit Cured in 10 to 20 days. No pay till Cured. DR. J. STEPHENS, Lebanon, Ohio.

MEN'S *vital weakness* quickly cured after all else fails. Trial treatment free. W. H. T. PAKLEY, P. O. Philadelphia, Pa.

NERVOUS DEBILITY in MEN quickly cured FRENCH HOSPITAL METHOD. New to America. Civiale Remedial Agency, 160 Fulton St., New York

266th EDITION. PRICE ONLY $1
BY MAIL POSTPAID.



KNOW THYSELF.
A Great Medical Work on Manhood

Exhausted Vitality, Nervous and Physical Debility, Premature Decline in man, Errors of Youth, and the untold miseries resulting from indiscretions or excesses. A book for every man, young, middle-aged, and old. It contains 125 prescriptions for all acute and chronic diseases, each one of which is invaluable. So found by the author, whose experience for 23 years is such as probably never before fell to the lot of any physician. 300 pages, bound in beautiful French muslin, embossed covers, full gilt, guaranteed to be a finer work in every sense—mechanical, literary, and professional—than any other work sold in this country for $2.50, or the money will be refunded in every instance. Price only $1.00 by mail, postpaid. Illustrative sample, 6 cents. Send now. Gold medal awarded the author by the National Medical Association, to the officers of which he refers.

This book should be read by the young for instruction and by the afflicted for relief. It will benefit all.—*London Lancet.*

There is no member of society to whom this book will not be useful, whether youth, parent, guardian, instructor, or clergyman.—*Armonaut.*

Address the Peabody Medical Institute, or Dr. W. H. Parker, No. 4 Bulfinch Street, Boston, Mass., who may be consulted on all diseases requiring skill and experience. Chronic and obstinate diseases that **HEAL** have baffled the skill of all other physicians a specialty. Such treated successfully **THYSELF** without an instance of failure

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *thirty-eight years' experience,* and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

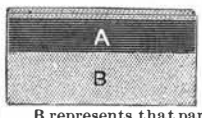
A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge,* a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.

AMERICAN OXIDE BRONZE CO
MAKES THE BEST AND CHEAPEST CAR BOX AND JOURNAL BEARING METAL
TENSILE STRENGTH, 39,292 Lbs TO THE SQUARE INCH ELASTICITY 9,718. FOR SALE TO THE TRADE IN INGOTS. THIS METAL CAN BE USED FOR ANY AND ALL PURPOSES. ADDRESS 402 WALNUT ST PHILADELPHIA



RUBBER BACK SQUARE PACKING.
BEST IN THE WORLD.
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.

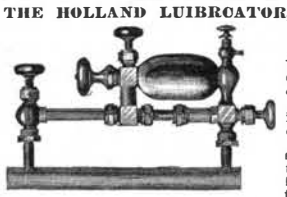
A, the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.

This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

NEW YORK BELTING & PACKING CO.,
JOHN H. CHEEVER, Treas. **Nos. 13 & 15 Park Row, opp. Astor House New York.**

THE HOLLAND LUBRICATOR, VISIBLE DROP Is guaranteed to be

1. A perfect insurance against the cutting of Valve-seats, Cylinder and Governor Valves of the engine.
2. It will pay for itself in six months, in the saving of oil, coal, and packing.
3. It will insure more speed in the revolutions of the engine, say from one to two strokes per minute, thus increasing the power of the engine.



M'f'd by Holland & Thompson, 217 River St., Troy, N.Y.

HYDRAULIC ELEVATORS AND MOTORS.—A paper by B. F. Jones, discussing some of the questions involved in the use of elevators and water motors that particularly concern towns supplied by direct pumping, and showing how the author has been able to overcome many of the difficulties that have presented themselves to his notice. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **392.** Price 10 cents. To be had at this office and from all newsdealers.

WESTON DYNAMO-ELECTRIC MACHINE

The undersigned, sole agents for the above machine for

ELECTROPLATING AND ELECTROTYPING,

refer to all the principal Stove Manufacturers, Nickel and Silver Platers in the country. Over 1,500 now in use. Are also manufacturers of **Pure Nickel Anodes, Nickel Salts, Polishing Compositions** of all kinds, and every variety of supplies for Nickel, Silver, and Gold Plating; also, Bronze and Brass Solutions. Complete outfits for plating. Estimates and catalogues furnished upon application.

HANSON VANWINKLE & Co.
SOLE AGENTS *NEWARK, N. J.*
New York Office, 92 and 94 Liberty St.

DEODORIZATION OF IMPURE SPIRITS by Electrolysis.—Description of MM. Naudin and Schneider's new and effective electrolytic process for rectifying alcohol. With four figures, giving details of apparatus and a view of a plant for a daily production of 220 gallons of alcohol. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **343.** Price 10 cents. To be had at this office and from all newsdealers.

THE COMPLETE HOME. Agents wanted for this beautiful book. New edition.—New bindings.—New illustrations from new designs. Superbly gotten up. Same low price. Adapted to all classes. Sells at sight. Agents doing big work. EXCELLENT TERMS. The handsomest prospectus ever issued. Apply now. BRADLEY, GARRETSON & CO., 66 North 4th St., Philadelphia, Pa. Also other grand new books and Bibles.

THE NEW YORK AND BROOKLYN Bridge.—A summary of the dominant features of this triumph of modern engineering. Act of incorporation of the Bridge Company. Surveys for the route. The plan accepted. Beginning of the work. Construction and sinking of the caissons. The towers. The anchorages. Details of cables and mode of suspension. The floor system. Approaches; stations; cars, and moving cars. Principal items of cost. Illustrated with ten figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **393.** Price 10 cents. To be had at this office and from all newsdealers. The same number contains a biographical sketch and portrait of Mr. John A. Roebling, the designer and first superintending engineer of the great New York and Brooklyn Bridge.

FOR SALE. A VALUABLE PATENT. A rare chance. Small capital only required. Address P. O. BOX 136, Fitchburg, Mass.

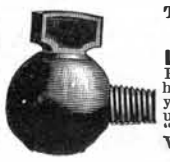
IRON AND STEEL.—INAUGURAL ADdress of Bernard Samuelson, M.P., before the Iron and Steel Institute. The world's production of pig iron. Heat of blast. Wonderful uses and demand for iron and steel. Progress of Bessemer steel. Latest improvements in iron making. Steel rails 150 feet long. Basic steel. The patent laws. Growth of the Siemens-Martin process. Present production of wrought iron. Progress of puddling. Gross of iron and steel ship building. A gigantic steamer. Remarkable machinery and tools. Future of iron and steel. Railway demand for iron and steel. Relations between employers and workmen. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **388.** Price 10 cents. To be had at this office and from all newsdealers.

$5 A DAY & MORE TO ACTIVE MEN AND WOMEN TO TAKE ORDERS for our ENLARGED PORTRAITS. Address OFNER & CO. 817 Arch St., Phila., Pa. **OUTFIT FREE!**

CHIPPENDALE FURNITURE.—ILLUSTrations of some of the more characteristic and representative designs for furniture reproduced, to scale, from the drawings of Thomas Chippendale; with descriptions of the same. With nine figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **389.** Price 10 cents. To be had at this office and from all newsdealers.

More people are poisoned by foul Refrigerators than by sewer gas. Three-fourths of Refrigerators sold breed malaria and fevers, by tainting the food. My **No. 50** House, Hotel and Restaurant Refrigerator will **keep anything** sweet and good. Price **$55** at any R. R. Station in the U. S. Send for Circulars. **B. A. STEVENS, Toledo, Ohio.**

THE MINERALOGICAL LOCALITIES in and around New York City.—By Nelson H. Darton. A valuable paper, showing the various localities within a half hour's ride from New York city from which may be obtained an excellent assortment of minerals. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **344, 349,** and **363.** Price 10 cents each, or 30 cents for the series. To be had at this office and from all newsdealers.



The most successful Lubricator for Loose Pulleys in use.
VAN DUZEN'S PATENT LOOSE PULLEY OILER.
Highly recommended by those who have used them for the past two years. Prices very reasonable. Every user of machinery should have our "Catalogue No. 55;" sent free.
VAN DUZEN & TIFT, Cincinnati, O.

FIRE BRICK, TILE AND CLAY RETORTS ALL SHAPES.
BORGNER & O'BRIEN
23 1/2 ST. ABOVE RACE. PHILADELPHIA.

SOME OF THE INDUSTRIAL USES OF the Calcium Compounds.—Four lectures by Thomas Bolas, F.C.S. I. Distribution and occurrence of calcium in nature. Carbonate of lime as limestone, chalk, marble, calcspar, shells. Notes on some of the calcium minerals. Short survey of the chemistry of calcium and of its derivatives. II. Lime. Calcination in theory and Practice. Influence of foreign bodies on its quality. Most favorable conditions for the decomposition of calcium carbonate. Cements and their uses. Lime as a refractory material. Lime light. The oxyhydrogen furnace. Lime moulds for casting iron and steel. A few of the industrial and economic uses of lime. III. Sulphate of lime. Its occurrence in nature. Gypsum and alabaster. Plaster of Paris, its preparation and uses. Setting of plaster, its physical and chemical aspects. Scientific principles involved in some of the applications of plaster—moulding, stereotyping, and other processes. IV. Other calcium compounds and their uses. The phosphorescent sulphide. Lime soaps. Bleaching powder. Phosphates of calcium. The hardness of water. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **327, 328, 329,** and **330.** Price 10 cents each, or 40 cents for the series. To be had at this office and from all newsdealers.

HIRES' IMPROVED ROOT BEER. Package, **25c.** Makes 5 gallons of a delicious sparkling and wholesale **beverage.** Sold by all Druggists, or sent by mail on receipt of **25c.** C. E. HIRES, 48 N. Del. Ave., Phila., Pa.

PURE WATER FOR PHOTOGRAPHIC Use.—Description of a simple apparatus for obtaining rain water in a state of purity, and of two forms of stills for photographers' use. Illustrated with three figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **360.** Price 10 cents. To be had at this office and from all newsdealers.

Good point to establish manufactories to supply the rapidly developing Northwest. Inducements offered. Address
Secretary, Board of Trade, St. Peter, Minn.

THE PRODUCTION OF FIRE.—AN interesting paper, describing the methods employed in ancient times, and among savages at the present day, of procuring fire by mechanical means. Illustrated with four figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **392.** Price 10 cents. To be had at this office and from all newsdealers.

MILLIONS CAN BE SOLD! If its new and useful. What have you got? Describe fully or send sample prepaid. **I keep 15 travelers constantly establishing county agents and can sell any good thing fast.** This is your chance. **CEO. P. BENT,** 81 Jackson St., Chicago.

CHEMISTRY OF BUILDING MATErials. The bearings of chemical science on certain prominent materials used for building purposes, such as stones, limes, mortars, cements, brick, marble, etc. 1. A brief account of the general principles of chemistry. The chemical substances which enter into the composition of the above-named materials, their characteristics, and directions for ascertaining their presence in any mineral. 2. Examination in detail of the several varieties of stone found in the earth, both as regards the proportions of their constituents, and their chemical and other properties. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **279.** Price 10 cents. To be had at this office and from all newsdealers.

Telegraph and Electrical SUPPLIES
Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue **C. E. JONES & BRO. Cincinnati, O.**
It is important to us that you mention this paper.

EXPERIMENTS IN ACOUSTICS.—A valuable paper containing accounts of an interesting series of acoustical experiments made by Mr. A. C. Engert, to show how sound may be propagated and improved by the use of steel plates and wires, and the principle involved in which is believed to be capable of development and application to the improvement of sound in buildings not properly planned for that purpose. The system has the advantage of simplicity and readiness of application; it is not cumbersome or unsightly, and need not interfere with architectural arrangements. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **247.** Price 10 cents. To be had at this office and from all newsdealers.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS.
THOMAS DEVLIN & CO. FINE TINNING, JAPANNING AND FINISHING.
LEHIGH AVE. & AMERICAN ST. PHILA.

HIGH RAILWAY SPEEDS.—BY W. Barnet Le Van. Description of trial trip of the "new departure" locomotive No. 5,000 (made by Burnham, Parry & Co.), from Philadelphia to Jersey City and return. Account of speed made between stations going and coming. Steaming capacity of the new locomotive's boiler. Water consumed. Best speed made, 81 miles per hour. Table of speeds in miles per hour of the *fast lines* in Europe and America. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **240.** Price 10 cents. To be had at this office and from all newsdealers.

AGENTS can make **$3** to **$15** per day introducing a new **Cash and Sales Book** to *business men.* No peddling. Sold from sample. Specimen sheets, showing plan of book, with all particulars, by return mail. Address
H. W. PAMPHILON, Publisher, 30 Bond St., New York.

PATENT FOR SALE. Elastic or Yielding spruce for foundry use. A great saving in patterns. Apply at Thomas B. Stetson, Solicitor of Patents, 23 Murray St., New York.

50 Large, New, Embossed border Chromo Cards, all gold, silver, motto and hand, name on, 10c., 13 pks. $1. Agts' latest samples, 10 cts. L. JONES & CO., Nassau, N. Y.

PERFECT
NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.

ROOT'S NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower
P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 22 Cortland St., 9 Dey St., COOKE & CO., Selling Agts., 22 Cortland Street, JAS. BEGGS & CO., Selling Agts. 9 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

WATER SUPPLY OF SMALL TOWNS.—Description of the new waterworks recently erected for supplying the town of Congleton, England. Filter-beds. Buildings. Pumping machinery. The process for softening hard water, with description of the apparatus. Illustrated with nine figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **392.** Price 10 cents. To be had at this office and from all newsdealers.

PATENT for sale. Just issued. Article in light hardware. Address "PATENT," box 207, Buffalo, N. Y.

BIBB'S
Great Original Baltimore-Made
Fire Place Heaters
Mantels and Registers.
B.C. BIBB & SON,
Baltimore, Md.
Best workmanship. Lowest prices guaranteed. Send for circulars.

FIRELESS LOCOMOTIVES FOR TRAMways.—A paper by G. Leutz, describing a type of fireless locomotive that is being built in considerable numbers in Germany for use in Java. Illustrated with five figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **361.** Price 10 cents. To be had at this office and from all newsdealers.

SAVE THE FLOORS.
NOISELESS RUBBER WHEELS,
FOR ALL PURPOSES.
GEO. P. CLARK,
WINDSOR LOCKS, CT.

THE "UNIVERSAL" GAS ENGINE.—A new and very simple gas engine invented by Messrs. Ewins & Newman. With nine figures of details. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **360.** Price 10 cents. To be had at this office and from all newsdealers.

Syracuse Malleable Iron Works

PHOTOMICROGRAPHY.—A PAPER OF interest to amateurs, showing how, by means of a simple contrivance which any one can make for himself, microphotographs may be taken without the use of a microscope or microscopic objective. Illustrated with one figure. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **391.** Price 10 cents. To be had at this office and from all newsdealers.

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & CO., Portland, Maine.

FOREIGN PATENTS.

Their Cost Reduced.

The expenses attending the procuring of patents in most foreign countries having been considerably reduced, the obstacle of cost is no longer in the way of a large proportion of our inventors patenting their inventions abroad.

CANADA.—The cost of a patent in Canada is even less than the cost of a United States patent, and the former includes the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, British Columbia, and Manitoba.

The number of our patentees who avail themselves of the cheap and easy method now offered for obtaining patents in Canada is very large, and is steadily increasing.

ENGLAND.—The new English law, which went into force on Jan. 1st, enables parties to secure patents in Great Britain on very moderate terms. A British patent includes England, Scotland, Wales, Ireland, and the Channel Islands. Great Britain is the acknowledged financial and commercial center of the world, and her goods are sent to every quarter of the globe. A good invention is likely to realize as much for the patentee in England as his United States patent produces for him at home, and the small cost now renders it possible for almost every patentee in this country to secure a patent in Great Britain, where his rights are as well protected as in the United States.

OTHER COUNTRIES.—Patents are also obtained on very reasonable terms in France, Belgium, Germany Austria, Russia, Italy, Spain (the latter includes Cuba and all the other Spanish Colonies), Brazil, British India Australia, and the other British Colonies.

An experience of THIRTY-EIGHT years has enabled the publishers of THE SCIENTIFIC AMERICAN to establish competent and trustworthy agencies in all the principal foreign countries, and it has always been their aim to have the business of their clients promptly and properly done and their interests faithfully guarded.

A pamphlet containing a synopsis of the patent laws of all countries, including the cost for each, and other information useful to persons contemplating the procuring of patents abroad, may be had on application to this office.

MUNN & CO., Editors and Proprietors of THE SCIENTIFIC AMERICAN, cordially invite all persons desiring any information relative to patents, or the registry of trade-marks, in this country or abroad, to call at their offices, 361 Broadway. Examination of inventions, consultation, and advice free. A member of the firm is always in attendance between the hours of 9 o'clock A. M. and 5 o'clock P. M. Inquiries by mail promptly answered.

Address, **MUNN & CO.,**
Publishers and Patent Solicitors,
361 Broadway, New York.

Branch Office, cor. F and 7th Streets, opposite Patent Office, Washington, D. C.

© 1884 SCIENTIFIC AMERICAN, INC

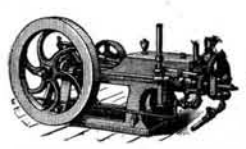
Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Gas Engines, ½ & 1 H. P., Now Ready.



For Power or For Pumping

GAS ENGINES.

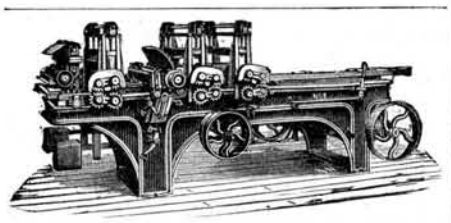
Simple, Substantial, Safe, Economical.

One horse power will pump 1,000 gallons of water 100 feet high per hour with 35 feet of gas. One-half horse power will pump 500 gallons 100 feet high with 25 feet of gas.

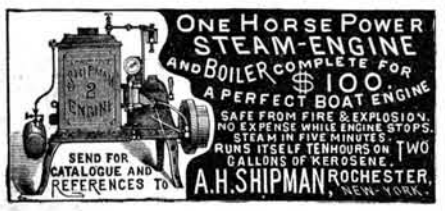
POWER DETERMINED BY ACTUAL TEST.

Call and see them, or for circulars and prices address

THE CONTINENTAL GAS ENGINE CO.,
No. 231 BROADWAY, NEW YORK.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.



BIG PAY to sell our Rubber Printing Stamps. Sample. free. TAYLOR BROS. & CO., Cleveland, Ohio.

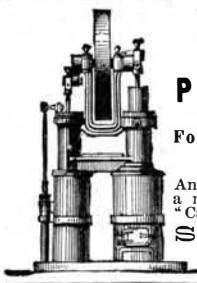
H.W.JOHNS'
ASBESTOS
LIQUID PAINTS.
ROOFING,

Fire-proof Building Felt,

Steam Pipe and Boiler Coverings, Steam Packing, Mill Board, Gaskets, Sheathings, Fire-proof Coatings, Cement, &c.

DESCRIPTIVE PRICE LIST AND SAMPLES FREE.

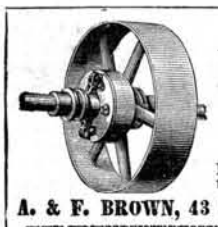
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.
170 N. 4th St., Phila. 45 Franklin St., Chicago.



The Rider Hot Air
COMPRESSION
PUMPING ENGINE
IMPROVED.
For Residences or Institutions.
Absolutely Safe.

Any house servant can run it. Has a record of nine years. Send for "Catalogue E."

SAYER & CO.,
34 Dey St., N. Y. City.



F. Brown's Patent
FRICTION CLUTCH.

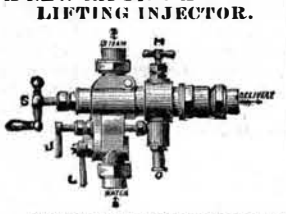
Send for Illustrated Catalogue and Discount Sheet to

A. & F. BROWN, 43 Park Place, New York.

SHAFTS PULLEYS HANGERS

WM. A. HARRIS,
Providence, R. I. (Park St.), Six minutes' walk West from station.
Original and Only Builder of the
HARRIS-CORLISS ENGINE,
With Harris' Pat. Improvements, from 10 to 1,000 H. P.
Send for copy Engineer's and Steam User's Manual. By J. W. Hill, M.E. Price $1.25.

The "MONITOR."
A NEW LIFTING AND NON-LIFTING INJECTOR.



Best Boiler Feeder in the world. Greatest Range yet obtained. Does not Break under Sudden Changes of Steam Pressure.

Also Patent
EJECTORS
OR
Water Elevators,
For Conveying Water and Liquid.
Patent Oilers, Lubricators, etc.

NATHAN MANUFACTURING COMPANY,
Send for catalogue. 92 & 94 Liberty St., New York.

BOYNTON FURNACE CO., 94 BEEKMAN STREET, NEW YORK.
Mfrs. of Boynton's Latest Pattern Furnaces, Ranges, and Heaters.

JENKINS' PATENT VALVES,
Gate, [illegible]le, Check, and Safety.
MANUFAC[illegible]OF BEST STEAM METAL.

Are the acknowledged s[illegible]orld. Have been in use since 1868, under all possible conditions, and never hav[illegible]
To avoid impo[illegible] valves are stamped "Jenkins Bros."

[illegible]KINS BROS.,
71 John Stree[illegible] Send for Price List "A." 79 Kilby Street, Boston.

American Bell Tele. Co. Dec 2 1882 Drawer 2 Phone

James Boyd, Philadelphia, Pa. **AGENTS:** Pond Engineering Co., St. Louis, Mo.
Rees, Shook & Co., Pittsburg, Pa. [illegible]elker & Ryan, Louisville, Ky. Marinette Iron W'k's Co., Chicago, Ill.
Gibson & Clark, Cincinnati, Ohio. [illegible]alker & Son, Detroit, Mich. Brand & Reichard, Minneapolis, Minn.
Chafer & Becker, Cleveland, Ohio. W[illegible] Craig, Chicago, Ill. English Brothers, Kansas City, Mo.
Dunham, Carrigan & Co., San Francisco, Cal. Hendrie & Bolthoff M'f'g Co., Denver, Col.

"BLAKE'S CHALLENCE" ROCK BREAKER.
Patented November 18, 1879.

For **Macadam Road** making, Ballasting of **Railroads**, Crushing **Ores**, use of **Iron Furnaces**, etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency*, and *simplicity*. Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of *Superiority* awarded by American Institute, 1879 and 1880.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

COMMON SENSE CHAIRS AND ROCKERS. Strong, durable, and comfortable. No light, trashy stuff, but good, honest home comforts. Special discount to clergymen. Send stamp for catalogue to
F. A. SINCLAIR,
Motville, Onondaga, County, N. Y.
For sale by all first-class Furniture Dealers.

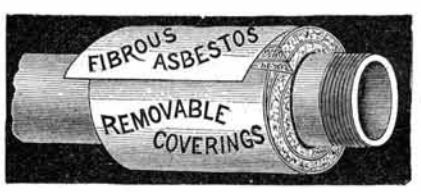
MICROSCOPES!

TELESCOPES,
FIELD GLASSES,
MAGIC LANTERNS,
BAROMETERS,
THERMOMETERS,
DRAWING INSTRUMENTS,
PHILOSOPHICAL AND CHEMICAL APPARATUS
Send for list and description of our ten Catalogues.
QUEEN & CO., Opticians, PHILADELPHIA

BOOKS ON BUILDING, PAINTING,
Decorating, etc. For 1883 eighty-eight page illustrated Catalogue, address, inclosing three 3-cent stamps, WM. T. COMSTOCK, 6 Astor Place, New York.

BARNES'
Patent Foot and Steam Power Machinery. Complete outfits for Actual Workshop Business. Lathes for Wood or Metal Circular Saws, Scrool Saws, Formers, Mortisers, Tenoners, etc., etc. Machines on trial if desired. Descriptive Catalogue and Price List Free. **W.F. & JOHN BARNES, No. 1999 Main St., Rockford, Ill.**

PIPE COVERING.



Fireproof Non-conducting Coverings for Steam Pipes, Boilers, and all hot surfaces. Made in sections three feet long. Easy to apply. **Asbestos Materials—Fiber, Millboard Packing, and Cement.**

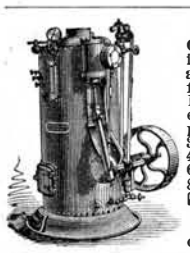
CHALMERS-SPENCE CO.
419-421 Eighth St., New York.

Emerson's New Book of SAWS
More than 100 Illustrations, 112 pages. Every rule given that will enable its Readers to overcome every difficulty, and Sawyers instructed in hanging, truing, Or straightening and running all kinds of Never failing of success. Now ready for Send your full address to [FREE distribution.
A 50,000 New Edition for 1884 W SAWS
Emerson, Smith & Co., Beaver Falls, Pa.

WATER.
Cities, Towns, and Manufactories
Supplied by GREEN & SHAW
PATENT TUBE AND GANG WELL SYSTEM.
Wm. D. Andrews & Bro., 233 Broadway, N. Y.
Infringers of above patents will be prosecuted.

NOTICE to Users of Steam Pumps.
We have received following letter in regard to one of our No. 5 "L" ($16) Steam Jet Pumps elevating 1¼ inch pipe of water more than 50 feet high:
"L'ANSE, MICH., Feb. 24, 1883.
"VAN DUZEN & TIFT, Cincinnati, O.:
"Money could not buy the Jet of us unless another could be had. I would not give your No. 5 "L" for a $700 pump, equal distance to raise.
"N. A. Litchfield, Supt. Mich. Slate Co."
We make Ten Sizes of these Pumps. Prices $7 to $75. Capacities 100 to 20,000 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps."
VAN DUZEN & TIFT, Cincinnati, O.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED *stronger* than any other Vise by **EAGLE ANVIL WORKS** only, Trenton, N. J.



BOOKWALTER ENGINE.
Compact, Substantial. Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor. Pump, etc., at the low price of

3	HORSE POWER.....	$240 00
4½	" "	280 00
6½	" "	355 00
8½	" "	440 00

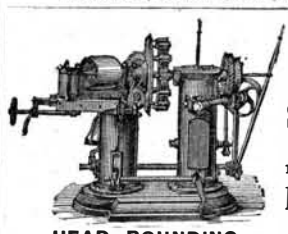
☞ Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

COLUMBIA BICYCLES AND TRICYCLES.
New Illustrated (36 page) Catalogue, giving full description of these machines, sent for 3 cent stamp.
THE POPE M'F'G CO.,
597 Washington St., Boston, Mass.

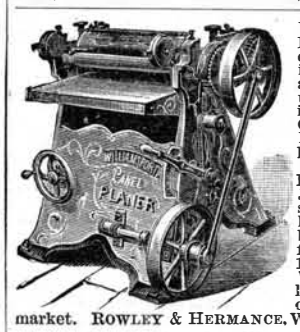
WATCHMAKERS.
Before buying, see the Whitcomb Lathe and the Webster Foot Wheel, made by the AMERICAN WATCH TOOL CO., Waltham, Mass.



HEAD ROUNDING.

BARREL, KEG, HOGSHEAD, AND Stave Machinery.
Over 50 varieties manufactured by
E. & B. HOLMES,
Buffalo, N. Y.

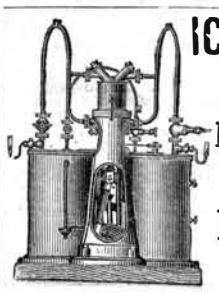
BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.



WILLIAMSPORT Pony or Panel Planer. For general use in Door Shops, Box and Furniture Manufactories. For planing Door Panels, Cigar Box Stuff, and Furniture work, it has no equal.
We use the Ellis Patent three part Journal Box and a solid forged steel head. Two pressure bars. Has strong feed. Will plane from 1-16 to 6 inch thick. Weight, 1,400 lb. The lowest priced first-class planer in the market. ROWLEY & HERMANCE, Williamsport, Pa.

SHEPARD'S CELEBRATED
$60
Screw Cutting Foot Lathe,
Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans. Address
H. L. SHEPARD & CO.,
341 & 343 West Front St., Cincinnati, O.

SOUTHWARK FOUNDRY & MACHINE COMPANY,
430 Washington Avenue, Philadelphia,
Engineers & Machinists,
Blowing Engines and Hydraulic Machinery.
Sole makers of the
Porter-Allen Automatic Cut-Off Steam Engine.



ICE MACHINES
Of all sizes, from
10 lb. per Hour to 50 Tons per Day
Binary Absorption System.
ECONOMICAL. SIMPLE, RELIABLE.
Send for Circulars.
Delamater Iron Works,
16 Cortlandt St., NEW YORK, U. S. A.

Cornell University.

COURSES IN
Electrical Engineering,
Mechanical Engineering,
Civil Engineering
and Architecture.

Entrance Examinations Begin at 9 A. M., June 16 and Sept. 16 1884.

For the UNIVERSITY REGISTER, containing full statements regarding requirements for admission, courses of study, degrees, honors, expenses, free scholarships, etc., and for special information, apply to THE TREASURER OF CORNELL UNIVERSITY, Ithaca, N. Y.

THE DINGEE & CONARD CO'S
BEAUTIFUL EVER-BLOOMING
ROSES

The only establishment making a SPECIAL BUSINESS of ROSES. 60 LARGE HOUSES for ROSES alone. We GIVE AWAY, in Premiums and Extras, more ROSES than most establishments grow. Strong Pot Plants suitable for immediate bloom delivered safely, postpaid, to any post-office. 5 splendid varieties, your choice, all labeled, for $1; 12 for $2; 19 for $3; 26 for $4; 35 for $5; 75 for $10; 100 for $13. Our NEW GUIDE, *a complete Treatise on the Rose*, 70 pp, *elegantly illustrated* FREE
THE DINGEE & CONARD CO.
Rose Growers, West Grove, Chester Co., Pa.

SPEAKING TELEPHONES.
THE AMERICAN BELL TELEPHONE COMPANY,
W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim: the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.
This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.
(Descriptive catalogues forwarded on application.)
Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.
All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against
Information furnished upon application.
Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

PROSPECTUS

OF THE
Scientific American
FOR 1884.

The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate.

One copy of the SCIENTIFIC AMERICAN and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal order or draft to order of
MUNN & CO., 361 Broadway, New York.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Phila., and 47 Rose St., opp Duane St., N. Y.

© 1884 SCIENTIFIC AMERICAN, INC